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No. 235

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WEST EUROPE

FRANCE

RADIATION LEVEL AT KOZLODUY ATOMIC POWER STATION CONSIDERED SAFE

Sofia ENERGETIKA in Bulgarian No 70, 1979 pp 27-30

[Article by Engineer Georgi Dichev, Engineer Boris Georgiev and Engineer Georgi Khitov, Kozloduy atomic power station: "Radiation Conditions at Kozloduy Atomic Power Station and in Ambient Environment"]

[Text] Kozloduy, the first Bulgarian atomic power station (APS), was put into operation in June 1974. The power capacity of the Kozloduy APS in the first stage is 880 MW--with two 440-MW power units with VVER-440 reactors. By the end of 1977 the atomic power station had produced more than 14 billion kWh of electric power.

During operation, full-scale continuous and systematic radiation monitoring is conducted at the APS and in the ambient environment.

Analysis of the data gives reason to assess the radiation conditions at the Kozloduy APS and in the ambient environment as very good, which is confirmation of the reliability and rather high performance of the APS's equipment.

Table 1

(1) Година	(2) Колективна доза бер на човек	(3) Колективна доза бер чов. на млн. kWh
1974	36	0,02
1975	329	0,13
1976	452	0,09
1977	323	0,06

Key:

1. Year
2. Collective dose, rems per person
3. Collective dose, rems per person per million kWh

The median annual external-irradiation dose for personnel employed in units I and II of the APS from the day of its commissioning up to 1 January 1978 is shown in Table 1.

From the data in Table 1 it can be seen that the personnel irradiation rate does not exceed 10-12 percent of the permissible annual dose of 5 rems, in conformity with Bulgaria's radiation safety standards [1], and has a tendency to decline, especially on the basis of electric power produced in millions of kWh.

The value of the collective irradiation dose for one unit, as per published data, does not exceed the values for analogous atomic power stations in the USSR [2, 3], the GDR [4] or the United States [5].

About 70-80 percent of the doses shown in Table 1 are produced during nuclear refueling and major overhaul of the technological facilities of the first loop with the reactor shut down and, first and foremost, by the gamma-radiation of the radioactive deposits on corrosion products.

Table 2

(1) Радионуклид	(2) Активност Ci/cm² · 10⁻⁸	(3) Относителна активност, %	(4) Гама-константа, P cm²/mCi	(5) Относителен дял в дозата, %
(6) Манган — 54	1,6	2,80	4,69	4,64
(7) Желязо — 59	0,1	0,18	6,25	0,39
(8) Кобалт — 58	1,1	1,92	5,57	3,79
(8) Кобалт — 60	0,58	1,02	13,2	4,78
(9) Хром — 51	3,8	6,66	0,15	0,35
(10) Цирконий — 95	11,0	18,94	4,19	28,48
(11) Ниобий — 95	13,0	22,78	4,44	35,67
(12) Рутений — 106	2,1	3,68	1,54	1,998
(13) Церий — 144	11,0	19,27	0,04	0,27
(13) Церий — 141	5,4	9,46	0,29	0,97
(14) Барий — 140	—	—	—	—
(15) Лантан — 140	0,3	0,53	11,1	2,06
(16) Сребро — 110	1,4	2,45	14,25	12,33
(17) Йод — 131	0,0	0,0	2,15	0,0
(18) Молибден — 99	5,7	9,99	7,011	4,33

Key:

1. Radionuclide
2. Activity, Ci/sq cm · 10^{-8}
3. Relative activity, %
4. Gamma-constant, P sq cm/mCi
5. Proportion of dose, %
6. Manganese
7. Iron
8. Cobalt
9. Chromium
10. Zirconium
11. Niobium
12. Ruthenium
13. Cerium
14. Barium
15. Lanthanum
16. Silver
17. Iodine
18. Molybdenum

This is confirmed by 1977 data, presented in Table 2, on the radionuclide composition of the deposits on equipment of the first loop and the proportion they represent of the external gamma-irradiation dose.

From Table 2 it can be seen that personnel irradiation can be lowered by eliminating from the coolant the radionuclides cobalt, silver, zirconium, niobium and manganese and by decreasing the content thereof in the deposits.

The other 20-30 percent of external-irradiation doses is produced during station operation at rated capacity, with the level of penetrating radiations not exceeding the design values of 28, 2.8 and 1.4 mrem/hr for unmanned, semimanned and manned rooms respectively, in conformity with the "Medical Regulations for the Design of Atomic Power Stations" [6].

In many rooms the dose rate is significantly lower than the design values.

Radiation conditions at an APS can be affected by fuel fission products. This is possible in cases where conditions are created for their buildup in the coolant and for their liberation therefrom.

Table 3 shows the average content of gaseous and vaporous fission products in the coolant of the first loop of units I and II in 1977.

The data of Table 3 make it possible to estimate the stack discharges of radioactive gases and iodine into the atmosphere when we know the amount of coolant flows in the first loop and the gas and iodine decontamination factor of the designed (authorized) decontamination system.

Since the coolant flow of the first loop is negligible (not more than 10 l/hr), and that mainly from the sampling chambers for the analysis of radionuclide composition, the gas discharges do not exceed 10-30 Ci/24-hour period.

Annual radioactive gas-aerosol and iodine discharges are shown in Table 3.

The mean annual values of gas-aerosol discharges are far below maximum permissible values.

The values of gas-aerosol discharges for 4, 5 and 6 March 1977, given in Table 4, as well as those for the entire month, show that the earthquake that took place on 4 March in the Vrancea region, Romania, which extended into the region of the Kozloduy APS, caused no increase in mean daily or mean monthly discharges in 1977.

These data indicate that there was no seal failure in the first loop of units I and II during the earthquake or afterwards and that radiation conditions at the APS and in the ambient environment did not change.

Table 3

(1) Радионуклид	(2) Активност Ci/l (3) I блок	(4) II блок	(1) Радионуклид	(2) Активност Ci/l (3) I блок	(4) II блок
(5) Йод — 131	$3,5.10^{-5}$	3.10^{-6}	(7) Криптон — 85 м.	4.10^{-5}	$3,5.10^{-6}$
(5) Йод — 133	$3,5.10^{-4}$	2.10^{-5}	(7) Криптон — 87	3.10^{-5}	$3,0.10^{-6}$
(5) Йод — 135	$6,0.10^{-4}$	4.10^{-5}	(7) Криптон — 88	6.10^{-5}	$1,0.10^{-5}$
			(8) Ксенон — 133	$6,10^{-4}$	2.10^{-4}
			(8) Ксенон — 135	$4,5.10^{-4}$	$3.5.10^{-5}$
(6) Всичко	$9,9.10^{-4}$	$6,3.10^{-5}$	(6) Всичко	$1,2.10^{-3}$	$2,5.10^{-4}$

Key:

1. Radionuclide
2. Activity, Ci/l
3. Unit I
4. Unit II
5. Iodine
6. Total
7. Crypton
8. Xenon

Table 4

(1) Година	(2) Аерозоли, mCi	(3) Газове, Ci	(4) Йод-131 парна фаза, in Ci
1974	7,84	5161,4	18,9
1975	120,9	6367,3	178,52
1976	(7) под 54,6	(7) под 2246,7	(7) под 58,8
1977	125,5	2299,2	167,9
(5) Март — 1977	9,9	214,8	1,4
4. III. 1977	0,1	5,0	0,05
5. III. 1977	0,03	5,3	0,05
6. III. 1977	0,03	10,5	0,05
(6) Допустими изхвърляния за едно денонощие	500,0	3500,0	100,0

Key:

1. Year
2. Aerosols, mCi
3. Gases, Ci
4. Iodine-131 vapor phase, mCi
5. March
6. Permissible discharges per day
7. Under

With these negligible amounts of gas discharges the external gamma-irradiation of the population living within 3 km of the APS did not exceed 10^{-6} rems per year, which is many times less than the natural irradiation dose in the region of the Kozloduy APS ($8 \cdot 10^{-3}$ rems per year [7]).

Internal irradiation of the human thyroid gland from milk consumption during the period when cattle are fed on local fodder can be determined from the iodine-131 concentrations measured in the milk. Such measurements for milk are made by the environmental-radiation monitoring laboratory at the APS. During the spring and summer period of 1977 when cattle were fed on fresh vegetation, values of 10-13 Ci/l were measured.

These values of iodine-131 concentration in the milk correlate with the iodine content of the water in the first loop (Table 3) and of the stack discharges of the APS, which were $6 \cdot 10^{-3}$ Ci for a summer month. Moreover, the dilution factor of the discharged activity can be taken as $4 \cdot 10^{5}$ cu m/sec [7], it being known that in the region of the Kozloduy APS the average wind velocity during the summer is 2 m/sec, given an air temperature t=+20° C and stack height of 150 m.

A criterion for calculating the effect of iodine-131 on the population is its presence in the organism of children under 1 year of age. If it is assumed that milk consumption is 0.5 liter per day, the intake of iodine-131 in the organism of children in 180 days will be 10^{-9} as against a permissible intake of 10^{-7} Ci/year [8].

Internal irradiation resulting from the inspiration of iodine-131 is negligible in comparison with what can result from milk consumption.

Direct measurements of the gamma-radiation rate around the APS show that the average level of the gamma dose rate is 8.84 ± 0.06 μR/hr and at not a single one of the measured points were reliable data registered that were higher than the natural background.

In 1977 the average density of radioactive deposits ($1.2 \cdot 10^{-4}$/Ci/sq km day) and the average concentration of aerosols ($1.8 \cdot 10^{-16}$ Ci/l) in respect of cumulative beta activity and their radionuclide composition (cesium-137 and strontium-90) correspond to general contamination and do not increase as one approaches the power station.

Constant measurements of the radioactivity of the soil, foodstuffs, vegetation, water, fish, meat and ground deposits in the region of the APS show that no statistically reliable effects of radioactive discharges from the stack and offtake channel on the radiation conditions have been established.

In view of the great importance of protecting the international waters of the Danube River against radionuclide polution, the Kozloduy APS has

organized thorough monitoring of the activity of the discharged bleed-off [debalansni vodi] and process water.

The beta-activity of the bleed-off water of the APS, discharged into the offtake channel, does not exceed 300 mCi/l[1]. In cases where the bleed-off water has activity greater than this value, it is channeled into special purification systems.

In the $35 \cdot 10^3$ cu m of bleed-off water discharged per year the total of beta-active radionuclides (excluding tritium) does not exceed 10 mCi/g, nor does the total of tritium exceed 50 Ci/g. This is significantly less than the discharges of the Gundremingen APS (FRG), which in 1976 [9] were 1900 mCi/g excluding tritium, and for tritium were 50 Ci/g for an APS electric capacity of 270 MW. This shows that the total discharged beta-activity and the concentration thereof in the bleed-off water at the Kozloduy APS are less than the generally accepted permissible values.

The mean annual beta activity of radionuclides in the offtake channel of the APS in 1977 (together with the beta-activity of naturally radioactive potassium-40--approximately 2 pCi/l) was about 2.20 pCi/l, which is 15 times less than the permissible total concentration of beta-radionuclides in the drinking water of open reservoirs [8] and 7 times less than the proposed permissible concentrations of strontium and cesium in the water of surface reservoirs set apart for fish breeding [10].

This fact is also confirmed by the low strontium-90 and cesium-137 content of the fish living in the warm water of the offtake channel of the APS and feeding off the flora of the channel.

In 1977 the strontium[2] and cesium content of the flesh of the fish was about 5.10 pCi/kg live weight, and total beta-activity content about 2000 pCi/kg.

With an annual average per-capita consumption of this fish of about 70 kg, the strontium-90 and cesium-137 intake in the human organism will be about $7 \cdot 10^{-10}$ Ci/g, which will amount to a body burden of 0.5 mrem in 50 years.

A dose of 0.5 mrem/g is 50 to 100 times less than the natural internal irradiation of the human organism from potassium, carbon and other elements [8].

According to data of the environmental-radiation monitoring laboratory, the mean annual beta-activity (including potassium-40) of Danube River water in the region of the city of Oryakhovo, which is 8 km downstream from the hot channel of the APS, has been determined to be 4-11 pCi/l.

If this value for the total beta-activity of the Danube River holds true for strontium-90 alone, it is 2 to 4 times less than the permissible strontium concentration (40 pCi/l), recommended in [10], for the water of

surface waterbodies and calculated for all kinds of consumption (intake from drinking water, fish, milk via the water-irrigated soil-grass-milk chain).

The measured strontium-90 dose in the Danube River water in the region of Oryakhovo (0.2 pCi/l) is 200 times less than the permissible dose.

The tritium concentration in the region of Oryakhovo (about 279 T. E. $\pm$29 T. E.)[3] is negligible in comparison with the permissible concentration (10^6 T. E.).

The data characterising radiation conditions at the Kozloduy APS and in the ambient environment for the more-than-3-year period of operation of the first two power units give reason to draw the following conclusions:

Given a high utilization factor for installed capacity, radiation conditions at the Kozloduy APS and in the ambient environment during the entire period of operation are very good. This indicates the high quality of the technical facilities, the quality of the construction and installation work that has been done, and the high skill of the attendant personnel;

The radioactive gases, aerosols, bleed-off and process water discharged by the APS into the ambient environment and the Danube River do not exceed the level of global contamination and the fluctuations of the natural background.

FOOTNOTES

1. 300 pCi/l is the permissible concentration in the drinking water in open waterbodies according to the radiation safety standards of Bulgaria and the USSR.

2. The permissible intake of strontium-90, one of the most dangerous radionuclides, is $320 \cdot 10^{-9}$ Ci/g.

3. 1 T. E. [tissue equivalent] = $3.2 \cdot 10^{-12}$ Ci/l.

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ENVIRONMENTAL CONTROL IN CHEMICAL INDUSTRY REVIEWED

Budapest MAGYAR KEMIKUSOK LAPJA in Hungarian Vol 34 No 9, 1979 pp 449-452

[Article by Rezso Simek, Chemical Plant Designing enterprise, Budapesti and Karoly Szasz, Ministry of Heavy Industry, Budapest]

[Text] Background

Matters of environmental protection were first studied in Hungary approximately 30 years ago by activists of natural-science associations joined in the MTESZ [Society of Technical and Scientific Associations]. Initially they studied the relevant foreign literature and acquainted themselves with the international situation; later, once they have acquired the required competence, they proceeded with analyzing and charting the domestic situation. Their professional and propagandistic activities soon found a powerful response, not only among scientific and technical experts but also from the public at large. As a result, the state organs and institutions dealing with environmental protection were established to deal with the ecological, economic, and technical problems, which became increasingly urgent.

State regulation started during the 1960's when, within the framework of the establishment of the legal prerequisites of environmental protection, the Mine Law and the Water Law were promulgated. The latter was followed by various high-level regulations, introducing a system of fines to ensure proper purification of wastewaters. Since the early 1970's one law after the other is being promulgated in the area of air purity. These laws also provide penalties for enterprises which are deficient in the protection of the environment.

However, protection of the environment is not primarily a matter of laws. Prevention of damage to the environment and rectification of existing damages can be, and must be, carried out by means of methods developed by

the natural sciences. The required financial means must be provided with the aid of methods aimed to create a suitable economic environment.

Comprehensive environmental-protection organization and engineering control takes place in Hungary since 1971 on the basis of the above consideration. The environmental tasks are outlined in Act II of 1976 and MT [Council of Ministers] Decree 2006/1976.(IV-1.). The latest government measure was Decree 1035/1977.(VIII.28.). It dealt with the "further development of the protection of nature and the environment" and established the National Environment- and Nature-Protection Council and the National Environment- and Nature-Protection Bureau. At the present time, the state control has been established in practically all areas concerning protection of the environment. Laws are in the process of being prepared for all remaining issues involved.

Our enterprises generally paid no systematic attention to the sources of contamination and to the decontamination of harmful substances before the promulgation of the above-mentioned laws and regulations. Their aim was to get rid of undesirable wastes as cheaply and as quickly as possible. The approach that the sole task of the technologist is to produce high-quality goods as economically as possible was generally employed. Insufficient attention was paid to the decontamination of air pollutants and wastes originating from the manufacturing process.This is why wastewater found its way into natural waters, for example. The atmosphere was regarded as an infinite receptacle; disposal of the waste was regarded as a matter of public refuse disposal.

Press reports emphasizing the importance of environmental protection, later also the promulgated laws and regulations, first elicited disinterest. However, they gradually opened people's eyes. In the meantime, the instrument complement, staff, and operations of the various institutions (Water-Management Boards, KOJAL [Petroleum Board], and so forth) dealing with environmental and health matters, and with the testing and control involved became increasingly sophisticated, so that these institutions became better able to determine the contaminants, localize their sources, and provide data to permit the authorities to assess appropriate fines.

Both the new awareness and the objective needs spurred the enterprises to introduce systematic research and development activities aimed at protecting the environment forthwith. The tasks allocated to the newly established environmental-protection teams and departments were the analysis of the manufacturing technologies, the determination of the pollution sources, the measurement of the concentration of the contaminants, and ultimately the reduction or prevention of pollution. Research and

design institutions also participate in this work. Significant material and moral support was provided by the state organs to the development projects.

Typical Enterprise Categories and Factory Pollution

The basic activity of chemical-industry enterprises is production, rendering of services, supply, trade, investment activities, installation projects, and research/development. Those enterprises engaged primarily in production are the major contaminants of the environment; the other activities have little or no effect of a harmful character on the environment.

The chemical-industry enterprises, especially the large ones, usually have an inhomogeneous manufacturing profile; for example we may find production of synthetic fertilizer, plant-protection agents, and plastics within a single enterprise. The product line of such enterprises is unfavorable insofar as the protection of the environment is concerned since the properties of the various wastes generated differ.

There may also be differences in the condition and up-to-dateness of various departments of a single enterprise. Insofar as this is concerned, the Hungarian chemical industry has the following pattern, or may be categorized as follows:

1. The design and construction of the new chemical-industry enterprises, established during the last 10-15 years generally meet the state requirements. The technologies and production equipment are up to the international standard, and means are available for the separation and decontamination of the harmful wastes. This does not mean, however, that further development is not needed: the technologies are modernized and the environmental-protection needs become increasingly severe. This applies especially to the recycling or decontaminating the industrial wastes.

2. Conversion of older plants, which need modernization anyway, for better environmental protection is preferably carried out simultaneously with the modernization.

3. For economic reasons, it is inadvisable to spend much money for improving the environmental protection in obsolete plants earmarked for scrapping.

4. The environmental-protection problems of plants not capable of being classified in any of the above three categories must be solved on a case-by-case basis, by modification or expansion of the technological process employed.

Table 1 shows the typical contaminants of various branches of the industry.

Environmental-Protection Activities

The environmental-protection activities of the research departments of the chemical-industry enterprises became increasingly successful in recent years. Many enterprises developed multistep, modern wastewater-purification systems independently, developed special bacterial strains for biological purification, and reduced the generation of harmful contaminants by technology modernization or replacement of intermediates, or changing the solvents used.

Experiments aimed at the agricultural utilization of ammonia-containing wastewaters (for irrigation purposes) are promising. A beautiful example of goal-oriented research if the separation of fluorine, an air pollutant, in foam columns, recovery from wastewaters, and processing into valuable cryolite or calcium fluoride for industrial use.

Serious problems are created in many chemical-industry enterprises by the fact that the drainage and sewerage systems are obsolete. Many enterprises are compelled to upgrade these systems. The problems were solved by setting up settling tanks, prepurifiers, and in-plant treatment steps, thereby reducing the loading of the central wastewater-purification systems and at the same time improving the efficiency of the purification process. An analysis of the technologies which contaminate the water enabled numerous enterprises to reduce their freshwater needs and to reduce their wastewater output.

Enterprise research aimed at reducing air pollution was also successful. In this area the studies also involve the determination of the pollution sources, the analysis of the manufacturing processes, the improving of the manufacturing processes, and the establishment of closed-cycle, continuous production technologies. In addition, the research teams also carry out systematic monitoring, develop automated measuring and warning devices, and introduce these devices in the plant.

Studies are underway on the purification of the effluent gases of the synthetic nitrogen fertilizer plants (which contain nitrogen oxides, NO_x). The

methods employed include selective catalytic reduction, cooling, and the use of adsorbents (natural zeolites). At the same time, studies are underway on the technical and economic advantages of the various methods. Many enterprises investigate the stopping of dust emission and recirculation of the dust into the technological process, the elimination of the so-called scatter sources, and utilization of the wastes (small amounts of NH_3, acid vapors, and solvent vapors).The environmental-protection efforts of the enterprises are supplemented by similar work carried out by research and design institutions. In addition to their other tasks, the research institutions develop novel, environmentally unobjectionable materials and technologies (lead-free gasoline additives, oil additives, and so forth), develop methods of measurement, measuring devices, and recording instruments, develop active monitoring stations, and so forth. The goal of the latest research activities is the implementation of "recycling operations." This is also in the forefront of international activities. Along these lines, a long-range research program, entitled "Development of Wasteless and Low-Waste Chemical-Industry Processes," was implemented.

Utilization of the results of studies carried out by enterprises and research institutions is effectively aided by the design enterprises. Within the framework of the cooperation, prototypes of several individualized, special purification/separation devices were designed and made (venturi scrubber, catalytic incinerator, industrial waste incinerator, and so forth). Experiences with industrial application so far are favorable, thereby confirming the success of the cooperation. In addition to the activities mentioned above, the design enterprises supply useful technical documentation for the enterprises and the authorities (design and engineering guidelines, descriptions of modern technologies, and so forth).

As a result of systematic development activities, the environmental harm created by the chemical-industry enterprises shows a continuous decrease. This improvement was at the expense of major sums of money, as attested by the fact that the chemical industry expends more than two billion forints on such investments during the Fifth Five-Year Plan period. Almost two-thirds of this sum is expended for wastewater-purification systems, one-quarter for precipitators for air purification, and one-tenth for modern waste disposal systems (dumping or incineration).Almost half of the costs are met by the enterprises' funds, and more than half by budgetary funds (Water Fund, Air-Purity Fund). It is expected that about twice the amount expended during the Forth Five-Year Plan period will be used for these purposes.

In the course of the investments, many enterprises converted coal-fired boilers to oil- or gas-firing to reduce SO_2 and soot emission considerably.

Table 1. Typical environment contaminants in the chemical industry*

Industry sector	Wastewater	Air	Waste
Manufacture of synthetic fertilizer	Inorganic acids Ammonia Ammonium nitrate Urea Fluoride	Nitrogen oxides Ammonia Fluoride Dust	Lime sludge wastewater sludge
Manufacture of inorganic base materials	Acids Alkalies Salts (alum, cyanides, and so forth)	Sulfur dioxide Chlorine Mercury Hydrochloric acid	Wastewater sludge
Manufacture of synthetic detergents	Sulfuric acid Detergents Phosphates	Sulfur trioxide Surfactants	
Manufacture of plant-protection agents	Active ingredients Intermediates Byproducts	Active ingredients Hydrochloric acid Phosgen	Active ingredients Intermediates Byproducts
Petrochemical industry and manufacture of other organic materials	Dissolved and suspended organic and inorganic chemicals	Organic vapors Gases Hydrochloric acid	Technological waste Wastewater sludge
Manufacture of plastics	Trichloroethane Catalysts, Formaldehyde Urea, Melamine, Phenol, Surface-active agents	Vinyl chloride Dichloroethane Hydrocarbons, Formaldehyde, Phenol, Styrene	Plastics, Chlorinated hydrocarbons

[Table continued on next page]

[Table continued from preceding page]

Plastics processing	Dust	Malodorous vapors	Plastic waste
Manufacture of synthetic fibers	Acrylonitrile Caprolactam Viscose Organic chemicals	Solvent vapors	Fibrous waste
Manufacture of pharmaceuticals	Synthesis products Animal and vegetable parts Fermentation mash	Dust Solvents Malodorous gases	Organic waste
Manufacture of rubber	Washing water	Carbon black Mercaptans	Floor sweepings Raw vulcanizates
Manufacture of enamels and paints	Solvents Resins Sodium sulfide Sodium cyanide	Solvents Base materials	Manufacturing waste
Manufacture of industrial additives	Toxic metals Phosphorus-sulfur compounds	Hydrochloric acid Solvents Mercaptans	Organic chemicals

* The significance of environmental contamination caused by industrial-gas manufacture, carbon processing, photochemical industry, manufacture of cosmetics and household chemicals, explosives manufacture, and the like is too small to warrant inclusion in the table. Nor did we consider noise pollution, which is not observed frequently.

In some other instances the elimination of an emission source generating large amounts of harmful dust was accomplished by introduction of a closed technology and containerized shipment.

The largest environmental-protection investment during the plan period was the wastewater purification system installed at the PVC-III plant of BVK [Borsod Chemical Combine]. Its cost was 800 million forints.Many of the investments are highly cost-intensive. In some instances it is necessary to reconstruct old and obsolete processes and their equipment completely, and in many enterprises it is necessary to build new plants to ensure that the operations comply with the provisions of the applicable regulations.

A problem of the chemical industry which becomes increasingly important is the handling of industrial wastes. Studies and developments in this area often resulted only in part solutions. Some enterprises utilized their combustible waste gases to generate energy. Results were also achieved in the reuse of certain wastes (regeneration of solvents, processing of calcium fluoride, selling waste acid, and so forth). Nonetheless, the rate of development is not enough. No modern industrial waste incinerating facility of adequate capacity, capable of meeting the needs, has yet been built. The only result of extensive studies in progress since several years is a small number of experimental waste incinerating facilities, dumping techniques, and plan documentation.

Evaluation

The environmental-protection activities of chemical-industry enterprises and institutions, as well as their development goals, are in line with the state regulations and basic principles. In those areas where the development is financed by budgetary funds or where the availability of funds is otherwise ensured (major individual investments), development progresses satisfactorily. Support available from the Water Fund and the Air-Purity Fund also spurred enterprise activities; however it would be desirable to refine and develop further the system of economic incentives in view of the great importance of the problems that require solution.

During the last 10 years the chemical industry expended more than three billion forints for environmental-protection investments. As a result, the level of pollution showed no increase in spite of the fact that the volume of production increased significantly.

The sum of all fines levied to violators of the water- and air-pollution regulations exceeds 100 million forints per year. The fines represent a

serious burden for the affected enterprises in most instances. The list of contaminants, the emission of which is punishable by a fine, is growing gradually, and the maximum permissible concentrations are reduced. On the other hand, the rate of development is relatively slow since the enterprises are compelled to fragment their intellectual and financial resources instead of concentrating them toward the solution of a single problem. Enterprise investment is hindered by the cost-intensiveness of environmental-protection investments, the inadequate level of the industrial background, the long time it takes to prepare an investment, and the lack of standard solutions.

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2542
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ENVIRONMENTAL PROTECTION AT NITROCHEMICAL WORKS

Budapest MAGYAR KEMIKUSOK LAPJA in Hungarian Vol 34 No 9, 1979 pp 463-469

[Article by Imre Harsanyi, Janos Damjan, and Zoltan Kolonics, Nitrokemia Industrial Works, Fuzfogyartelep]

[Text] Industrial production started in Fuzfogyartelep by Nitrokemia Industrial Works in 1928. Rebuilding of the factory after the liberation was completed in 1950, and expansion started on an increasing scale thereafter. At the present time the enterprise produces more than 300 different products and the value of the production is more than 4 billion forints per year.

Environmental-protection activities, specifically purification of wastewater and effluent gases as well as waste disposal, started with appropriate studies in a systematic form during the late 1960's. Since this factory is located near Lake Balaton, which is the major recreational area of Hungary, the measures that resulted from these studies were first aimed at the protection of Lake Balaton.

The following are the major achievements so far at Nitrokemia in the field of environmental protection:

Water Management, Wastewater Purification

Figure 1 illustrates the water-flow diagram of Nitrokemia Industrial Works. As can be seen, water for industrial purposes is taken from Lake Balaton and drinking water is taken from carst wells. The wastewater of the plant flows into the Danube via the Sed-Nador canal (which is about 200 km long) and the Sio canal.

Figure 2 illustrates the water management of the plant at the time when the environmental-protection activities started. Figures 1 and 2 show clearly that major changes have taken place as a result of the work performed

over the years. The following facilities were completed in the course of the development work:

- We gradually expanded the recirculating water cycle, so that the consumption of fresh water increased since 1960 only by 20 percent in spite of the fact that the production of the plant increased ninefold during the same period. Figure 3 shows the percentage changes of water consumption and the value of the production.

- We constructed a new purification facility for the fecal wastewater generated by the residential area associated with the plant. Before, an obsolete and overloaded facility was used to purify the fecal wastewater. With the aid of a pumping station forming part of the purification facility we transfer the purified wastewater into the Sed spring, which flows into the Danube via the Sio and Nador canals.

- We constructed a pumping station for the transfer of the clean cooling and precipitation waters, flowing into Lake Balaton, into the Sed spring. As a result, no water flows directly from the plant into Lake Balaton. In this manner we eliminate the risk of accidental contamination of Lake Balaton.

- We constructed a new sewer network in the plant, so that we can now separate 7,400 m^3 "harmless wastewater" from the total of 13,500 m^3 wastewater , which before flow into the main collector drain. The harmless wastewater, which only contains inorganic acids or salts, is partly neutralized and drained gradually into the Sed spring. Full neutralization of the wastewater takes place in the spring since its water contains large amounts of hydrocarbonates.

- We developed the purification technology for the industrial wastewater, which is only 6,100 m^3 per day at the present time, and we also designed the purification plant needed for this technology.

To ensure that the wastewater purification system operates properly, we provided the following:

- We modified the manufacturing technologies of those products—such as nitrobenzene, nitroethylbenzene, ion-exchange resins—in which wastewaters that are difficult to purify are generated. We employed essentially the same approach for the manufacture of nitrobenzene and nitroethylbenzene: The crude nitro products, which are separated from the waste acid after the nitrating process, are treated with a small amount of 40 percent alkali solution and solid soda ash, so that all impurities

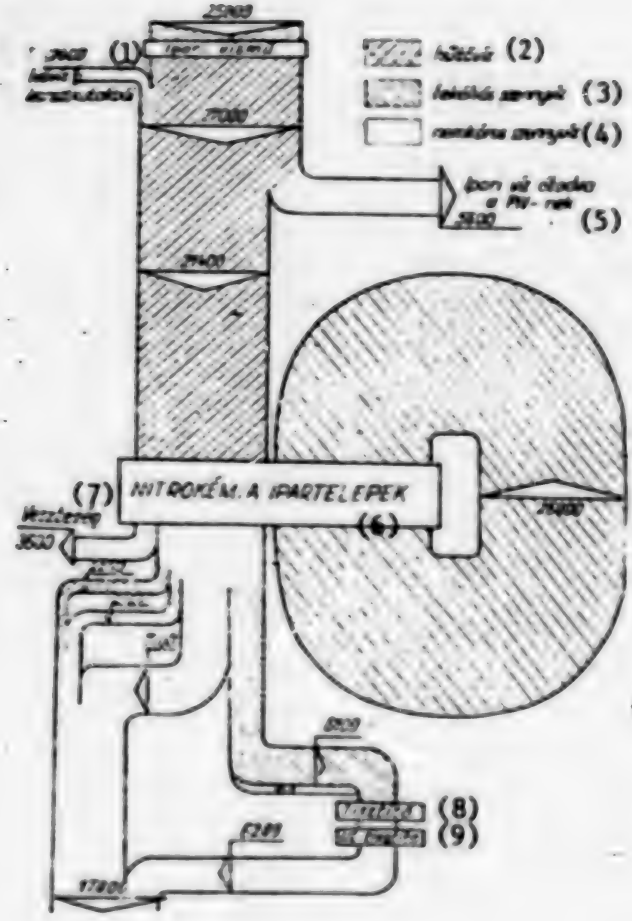

Fig. 1. The principle of the water flow at Nitrokemia Industrial Works (1978)

Key: 1. Plant waterworks
2. Cooling water
3. Fecal wastewater
4. Harmless wastewater
5. Industrial water suplied to PIV (Cotton-Weaving Enterprise)

precipitate. The precipitate is then removed by filtration and is incinerated. Earlier, the crude nitro products were water-washed, so that large amounts of additional wastewater was generated.

In the manufacture of ion-exchange resins we introduced several modifications: by installing a countercurrent multistep diluting and distillin;

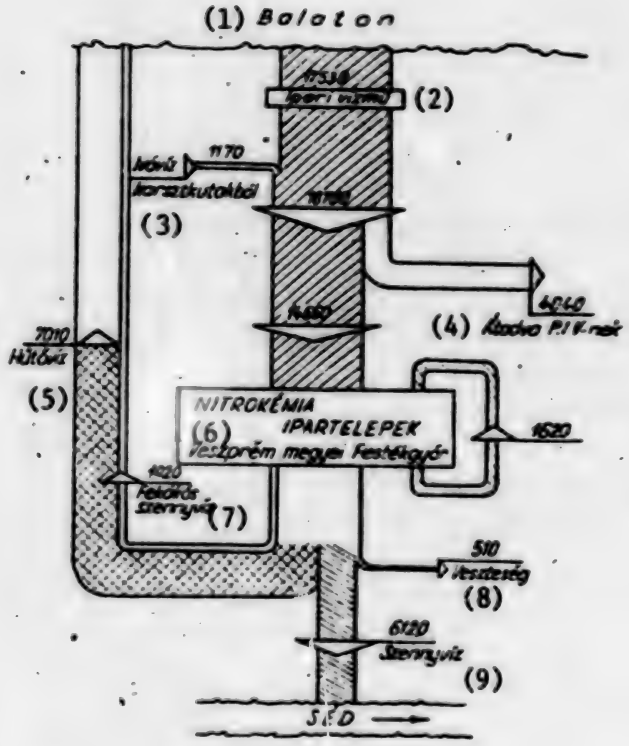

Fig. 2. The principle of the water flow at Nitrokemia Industrial Works (1960)

Key: 1. Lake Balaton
2. Plant waterworks
3. Drinking water from carst wells
4. Supplied to PIV
5. Cooling water
6. Nitrokemia Industrial Works Megye Veszprem Dye Factory
7. Fecal wastewater
8. Loss
9. Wastewater

concentrator we can now recirculate all the common-salt solution into the manufacturing process. In this way we also recover those valuable industrial materials which were earlier discharged into the drain with the common-salt solution.

We constructed new, continuously operating plants for the manufacture of chlorinated methyl ether, so that the 22 percent hydrochloric acid

solution generated as a byproduct—which earlier flowed into the sewer because of its high organic-matter content—can now be sold.

- We introduced local purification for the plant wastewaters which are highly toxic and cannot readily be purified by biological means. The wastewater generated in the manufacture of Dikonirt is treated with potassium permanganate in an acid medium to decompose the dichlorophenol. From the wastewater generated in the manufacture of Niptan we first recover the isopropylamine by distillation, and then remove the sulfide with hypo. The wastewater generated in the manufacture of MG 02 50 EC (plant-protecting agent) is neutralized with a solution of NaOH, and then filtrated to remove the precipitated organic matter after the alcohol has been distilled off. We discharge the treated wastewaters into the sewer, whence they flow, together with the other wastewaters, into the biological purifiers.

  In the more critical plant sectors we built local settling tanks and solvent traps, so that the degree of contamination of the plant wastewater entering the purifier is much reduced.

  We organized the collection and sale of waste sulfuric acid and hydrochloric acid generated in the plant. The waste sulfuric acid is used in the manufacture of synthetic fertilizer; the hydrochloric acid is used for removing lime deposits from water pipes.

Purification of Plant Wastewaters

Selection of the Method

We tried many methods for the purification of the plant wastewater. Among the physico-chemical methods (oxidation, extraction, and adsorption), we were able to obtain adequate purification only by means of treatment with activated carbon. But this approach turned out to be very costly because of the high activated-carbon consumption (4 kg/m^3), resulting in a cost of almost 80 forints per m^3. Since our efforts toward the regeneration of the activated carbon, aimed at reducing the costs, were unsuccessful because of the lack of domestic activated carbon of adequate strength, we did not introduce this method.

Parallel to the experiments with physico-chemical purification methods, we also tried biological purification methods. The results of these trials

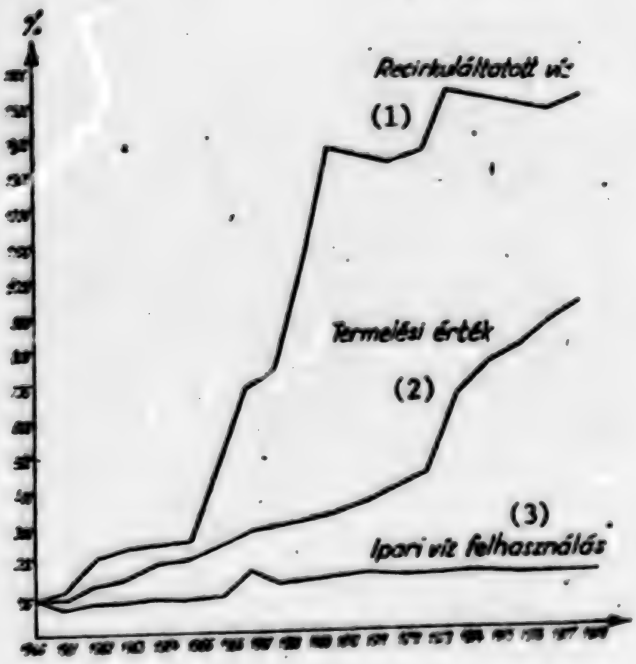

Fig. 3. Values of production and water consumption between 1960 and 1978 (percentages)

Key: 1. Recirculated water
2. Value of the production
3. Consumption of industrial water

were quite favorable. We estimated that the costs of purification—only the biological purification itself—will likely be no more than 2 forints per m^3. We have therefore decided to implement this method.

We had to carry out the biological purification trials with great circumspection because of the complex composition of the wastewater, major fluctuations in composition, and high toxicity. The laboratory experiments took approximately one year, and they were followed by pilot-plant trials for a period of six months. We designed the pilot wastewater purification plant so that it resembled the industrial-scale biological wastewater purification system we expected to be the most suitable.

After the completion of the laboratory and pilot-plant trials with success, we designed the large-scale biological purification system (the design team of our enterprise did the job). In finalizing the design, we had to

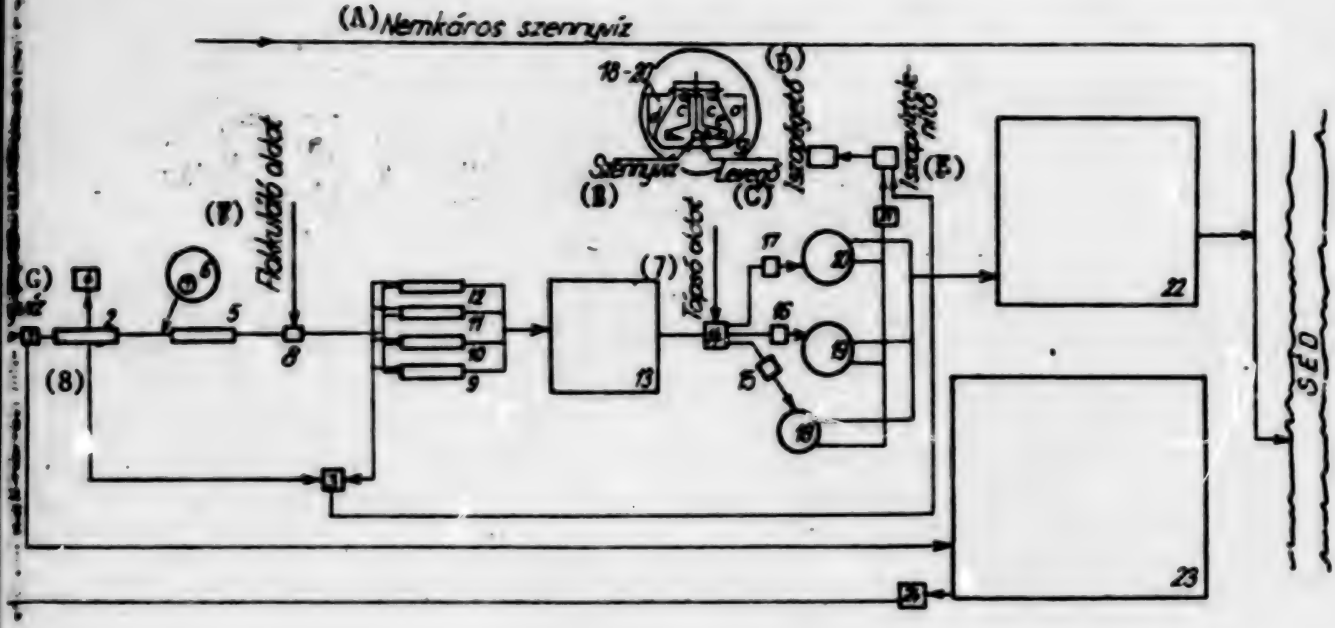

Fig. 4. Flow chart of the wastewater purification system of Nitrokemia Industrial Works

Key:
1. Meter
2. Settling tank
3. Collecting basin
4. "
5. Neutralizer
6. Hydrated lime reservoir
7. Metering device
8. Feeder of flocculating solution with stirrer
9. Settling tank
10. "
11. "
12. "
13. Homogenizer
14. Mixing vessel
15-17. Meters
18-20. Aerated settling tanks
21. Collecting vessel
22. Afterclarifying basin
23. Emergency basin
24. Transfer pump
A. Harmless wastewater

B. Wastewater
C. Air
D. Sludge incinerator
E. Sludge dehydrator
F. Flocculating solution
G. Plant wastewater

consider the important goal that the system must operate in a highly reliable manner during every season, including the winter.

Description of the Wastewater Purification System

Figure 4 is the flow chart of the wastewater purification system.

The generated wastewater flows through the meter (1) into the longitudinally flowing tank (2) clad with acid-resistant material. There it dwells for 50 minutes during which time the solid matter precipitates to the bottom of the tank whence it is transferred to the sludge basin at the entry end of the tank with a continuously moving scraper. The sludge passes from there continuously into the collecting basin (3). The oily matter in the wastewater floats to the surface while the solid matter settles. The oily matter is removed from the surface by a deflector panel and transferred into a collecting basin (4) for subsequent incineration.

The wastewater, now free of most of the impurities, flows from the settling tank to the neutralizer tank (5) which is also clad with acid-resistant material and is also designed for a residence time of 50 minutes. This tank is also long in shape and contains 20 propeller stirrers to provide intensive liquid flow which is needed for the neutralization process. Neutralization is carried out with hydrated lime, which flows to the wastewater via the channel connecting the settling tank (2) and the neutralizer. The hydrated lime is added automatically (6) with the aid of a metering device (7) within the lime reservoir. The metering device is controlled by a pH-sensing electrode immersed in the wastewater leaving the neutralizer.

From the neutralizer (5) the wastewater enters the basin (8) where it dwells for 2 minutes and where it is mixed under intensive stirring with flocculating solution. Thence it flows into the settling tanks (9-12) which are also longitudinal. They are essentially similar to the settling tank (2) except that they are not clad with acid-resistant material; they are merely coated with a special resin-based paint to resist sulfate corrosion of the concrete, and remove gypsum sludge and metal hydroxides.

The sludge separated in these tanks passes continuously into the collection basin (3) whence it is transferred together with the sludge from the settling tank to the sludge dehydrator. From the settling tanks the wastewater flows into the homogenizer basin (13), which is clad with polyethylene foil and is merely excavated in the ground. Proper homogenization is ensured by the fact that the wastewater enters the basin via several pipes in several locations (the same applies to the discharge pipes).

The wastewater, of which the composition is relatively uniform, dwells 36 hours in the basin, and then flows into the mixing vessel (14) where the phosphate salt solution is added. From the mixing vessel, the wastewater flows via several pipes through meters (15, 16, and 17) into the live-sludge basins (18, with a throughput of 1,000 m^3/day)(19 and 20, with throughputs of 2,500 m^3/day) where a combination of aeration and settling takes place.

The combination basins were developed in our enterprise; they are similar in their principle to the conventional aeroaccelerators. Essentially they are circular, 6 m deep concrete basins separated by a bell-shaped sheet-steel divider into an inner aerating section and an outer settling section. The wastewater and the compressed air are fed to under a turbine stirrer (b) designed for a residence time of 8 hours, which uniformly mixes them with the entire contents of the aerating space. The mammoth-pump effect created by the injected air causes the liquid level to rise in the aerating section, so that the purified wastewater/live sludge mixture flows into the settling section through the window (c) in the separating wall. From there the sludge passes back to the aerating space through the opening below the separating wall (d), while the purified water leaves through overflow troughs. In the aerating section of the basins there is a sludge scraper (e) driven by the liquid flow generated by the turbine, to prevent any deposition of the live sludge in the bottom area away from the turbine. The excess live sludge leaves the bottom of the settling section continuously via a compressing section (g) in part of the bottom of the settling section. From there the sludge is transferred into the sludge dehydrator.

A major advantage of this aerating-settling device is that the extent of purification does not decrease during the cold winter months. During those months the wastewater flows from the homogenizers into the purifiers at an average temperature of 0°C, and in the latter it heats up to 7-8°C partly as a result of the heat generated by the biological processes and partly as a result of the heat generated by the compressors (warm air). At this temperature the desired degree of purification can be achieved solely by increasing the concentration of the live sludge.

The purified wastewater from the aerating-settling devices (18-20) goes continuously into the afterclarifying basin (22), designed for a residence time of 20 days. Finally it is discharged into the Sed.

The emergency basin (23) is provided to accommodate the excess water which accumulates in sudden increases in the supply and flows out before the meter (1). The wastewater accumulated in this basin is transferred into the wastewater purification system with the pump station (24) during week-ends, when the plant generates smaller amounts of wastewater. The emergency basin also serves for accommodating the full amount of wastewater if there is a major malfunction in the purification system.

The Most Important Data of the Operating System

Table 1 summarizes the test results for the inflowing wastewater and the outflowing purified water.

It can be seen that the purifying efficiency of the wastewater-purification system—based on the oxygen consumption measured by means of the potassium bichromate method—is 87 percent on the average. The toxicity of the wastewater decreases from a 13-30 fold dilution level to zero after the purification. It happens occasionally that the toxicity of the purified water is a 0-3 fold dilution level but in these cases the toxicity of the wastewater before purification is at the 30-60 fold dilution level on the average.

Table 1. Test results for the incoming wastewater and the outflowing purified water (aerating and settling systems)

Designation	Wastewater to be purified (after the mixing vessel), mg/liter	Purified wastewater mg/liter
KOI ($K_2Cr_2O_3$)	2,000	210
NH_3	90	12.6
NO_3	50	45
NO_2	14	2
Organic	35	15
PO_2	20	1
Toxicity (Daphnia test	15-30 or 30-60 dilution level	0-3

Air Purification

The fast growth of the plant during the late 1950's created a number of air-pollution problems also. Grapes and other types of fruit became unfit for human consumption over a wide area because of bad flavor. There were frequent complaints from recreation areas near Lake Balaton in the vicinity, claiming that the people could not enjoy their recreation.

To eliminate the pollution of the air, we first surveyed the air-polluting sources and then developed the various purifying systems one by one. We installed bag filters of various kinds—such as bags made of Mikropull—to retain pesticide powder. We purify contaminating gases and vapors from the air by various scrubbers.The earlier scrubbers were columns packed with Raschig rings, into which the air was fed from the bottom and the scrubbing solution—such as water, alkali solution, or hypo—was fed from the top.

Later we developed venturi scrubbers for cleaning air contaminated with dichlorophenol—in cooperation with VEGYTERV [Chemical Plant Design Enterprise]—with which our experiences were favorable. These scrubbers reduce the dichlorophenol concentration from 80-120 mg/m^3 to 0.5-1 mg/m^3 , using a 20-25 percent alkali solution as the scrubbing liquid. Most recently we started to install a turbulent-flow scrubber tube developed by the Occupational Safety Research Institute to replace the earlier scrubbers with Raschig rings, primarily because the former requires little space and low investment expenditure.

We use the catalytic incinerating system illustrated in Fig. 5 to purify air which is contaminated with mercaptans. The system, having a capacity of 3,000 m^3/hour, contains palladium catalyst on a silica-gel substrate. The air becomes practically odorless and we were unable to find any organic contaminant in the purified air. This was determined under a 10,000 m^3/m^3 loading on the catalyst at 250-300°C with air containing 1,000 mg/m^3 contaminant.

As a result of the installation of the purifying devices no significant air pollution takes place in our enterprise. To prevent air pollution resulting from carelessness, we installed samplers in each air-purifying device. The samplers are of simple design: they consist of membrane pump, gas meter, and two scrubbing flasks in series. Checking is very labor-intensive with these devices—the scrubbing liquid must be replaced daily and laboratory analyses must be performed—therefore we developed the air-pollution measuring instrument illustrated in Fig. 6. This instruments operates on the basis of the following principle:

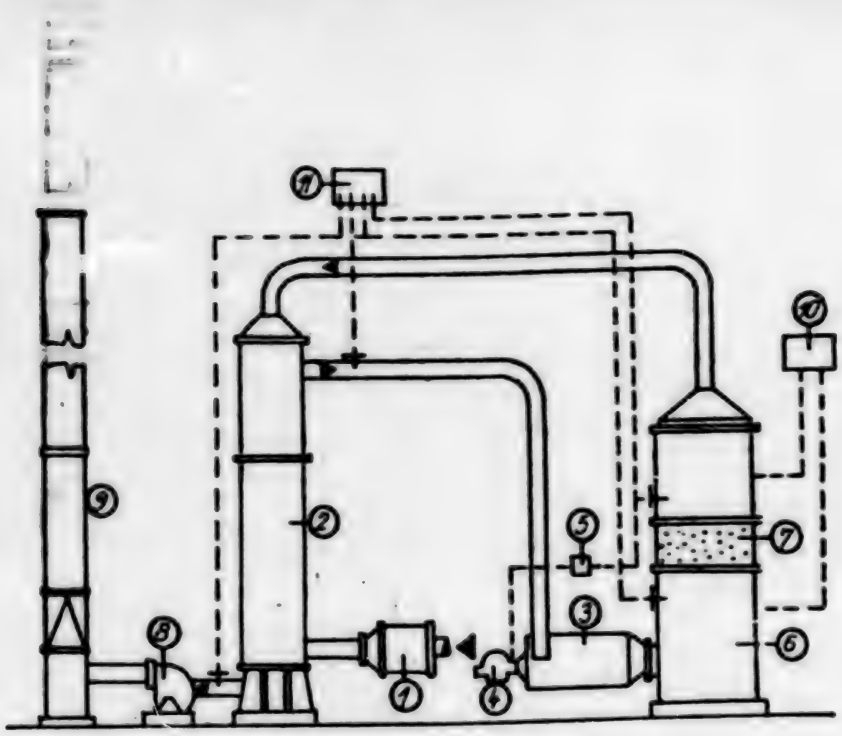

Fig. 5. Flow chart of the catalytic air-purifier

Key:
1. Dust filter
2. Heat exchanger
3. Burning-in space
4. Oil burner
5. Burner regulator
6. Reactor
7. Catalyst bed
8. Fan
9. Chimney
10. Manometer
11. Temperature recorder

We contact the continously sampled air with a reagent solution in a suitable absorbing system, so that the contaminant is absorbed in the solution. We convert the change of the pH or—which is of major interest—the ion concentration or conductivity of the reagent solution entering or leaving from the absorber system, using an appropriate electrode system. The change is in proportion to the concentration.The electrical signal obtained in this manner may be amplified and recorded, or may be telemetered to the observation site. Making use of the latter possibility, we developed a radio-telemetric measuring system, of which the schematic drawing is illustrated in Fig. 7.

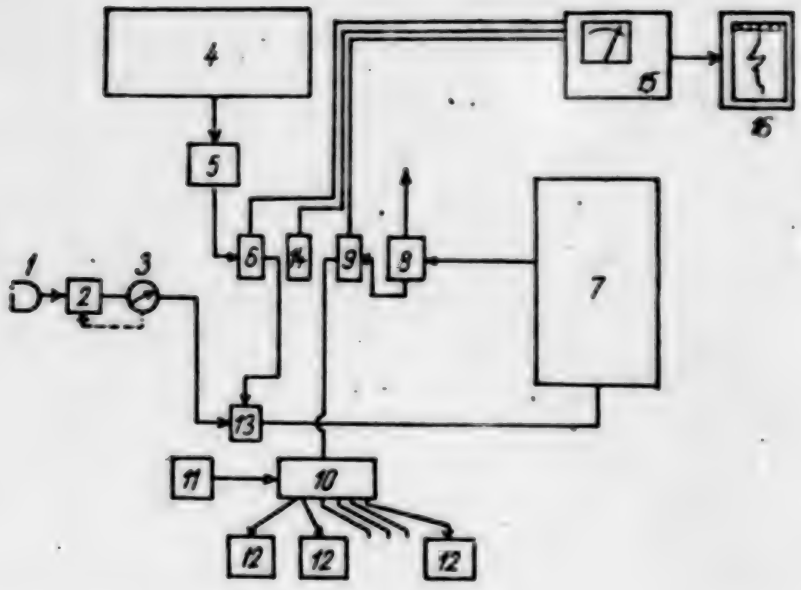

Fig 6. Schematic drawing of the air-pollution measuring instrument

Key:
1. Dust filter
2. Pump
3. Flowmeter
4. Reagent storage
5. Level regulator
6. Ion-selective electrode
7. Absorber
8. Drop separator
9. Ion-selective electrode
10. Programmer
11. Flow switchover
12. Reagent collector
13. Liquid-air mixing vessel
14. Reference electrode
15. Amplifier
16. Recorder

Waste Disposal

The environmental-protection activities of an industrial enterprise can be successful only if they are of a complex character. Accordingly, waste disposal assumes an important position in the environmental-protection activities of our enterprise. The tasks in this connection involve the collection and incineration of the wastes generated in the course of production, packaging, storage, and so forth.

A prerequisite of our waste-disposal activities is the organization of the collection, storage and transportation of the wastes. We established waste

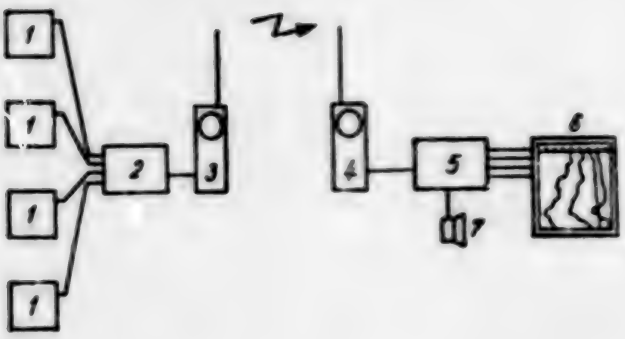

Fig. 7. Principle of the radio-telemetric signal transmission device

Key: 1. Instruments to measure water and air contamination
2. Encoder
3. UHF transmitter/receiver
4. "
5. Decoder
6. Recorder
7. Alarm device

collection and transportation systems in all production and service sections. The task of these systems is the collection and deposition of all wastes from the section at a designated location.

Transportation of the accumulated waste to the incinerator is carried out by a separate unit with trailers and pickup carriages. The amount of waste received and related accounting activities are recorded as needed.

We have three furnaces for the incineration of the waste. Our first tunnel furnace was built in 1964; it serves primarily to incinerate liquid and solid matter. We have reported on various occasions about the design and operating experiences of this apparatus. We have made various modifications since, so that we now have increased capacity, better incineration, and lower smoke emission. At the present time, the capacity is 1,200 tons per year for waste solvents and 1,500 tons per year for solid waste.

There is another tunnel furnace in our enterprise, which differs from the first furnace by the fact that it is fed with an automated Type B8-OS GHELFI slurry burner. By using it, we can incinerate various slurries and sludges (biological sludge in a continuous manner. The liquid and sludge

incinerating capacity of our second tunnel furnace is approximately 1,800 to 2,000 tons per year.

During the last eight years we conducted numerous discussions with firms manufacturing modern waste incinerators (Wagner-Biro, VKW, Schiller-Jamart, Bergun SPA, Duiker, Purator, and so forth) about the procurement of a high-capacity waste incinerator. Unfortunately, because of the world economic depression which developed since we were unable to secure the sum of approximately 300 million forints, which would have been required, so that we had to give up the idea of procuring a modern waste incinerator with an annual capacity of 15,000 tons, which was included in our plans.

At the same time we had to provide for the incineration of approximately 5,000 tons of various packaging material, plastic, waste, and the like. As an emergency measure, we considered the conversion of an unused Hoffmann type lime calcining round furnace. On the basis of experimental incinerations we converted the round furnace and equipped it with an oil-fired afterburning chamber system so that the effluent gases contain no organic matter whatsoever. At the same time, by using the countercurrent incineration principle we ensured that the organic-matter content of the residual slag is less than 0.2 percent by weight. When operated round the clock, the furnace has a capacity of 4,500 to 5,000 tons per year.

With the aid of the three waste incinerators our enterprise eliminates the need for storing waste containing organic matter. In addition, since 1972 we accept for incineration the waste pesticides from wholesalers and users according to an agreement between the Plant-Protection Main Department of the MEM [Ministry of Agriculture and Food] - AGROTROSZT [Agricultural Trust].

We do not regard the present heterogeneous state of our waste-incineration activities as final. We continue to seek ways for establishing a modern rotating-drum type waste incinerating system. Thus, our engineering development plan calls for the construction of an experimental plant with an annual capacity of approximately 10,000 tons. Figure 8 illustrates the planned system. As can be seen from the schematic drawing, we will have various means for measuring the various incineration and effluent-gas purification parameters during operation, and for various adjustments with special emphasis on chemical-industry wastes with varying composition.

Environmental Protection Control Service

Supervision of the environmental-protection activities of our enterprise is carried out in a continuous manner since 1964 by the Environmental Protection

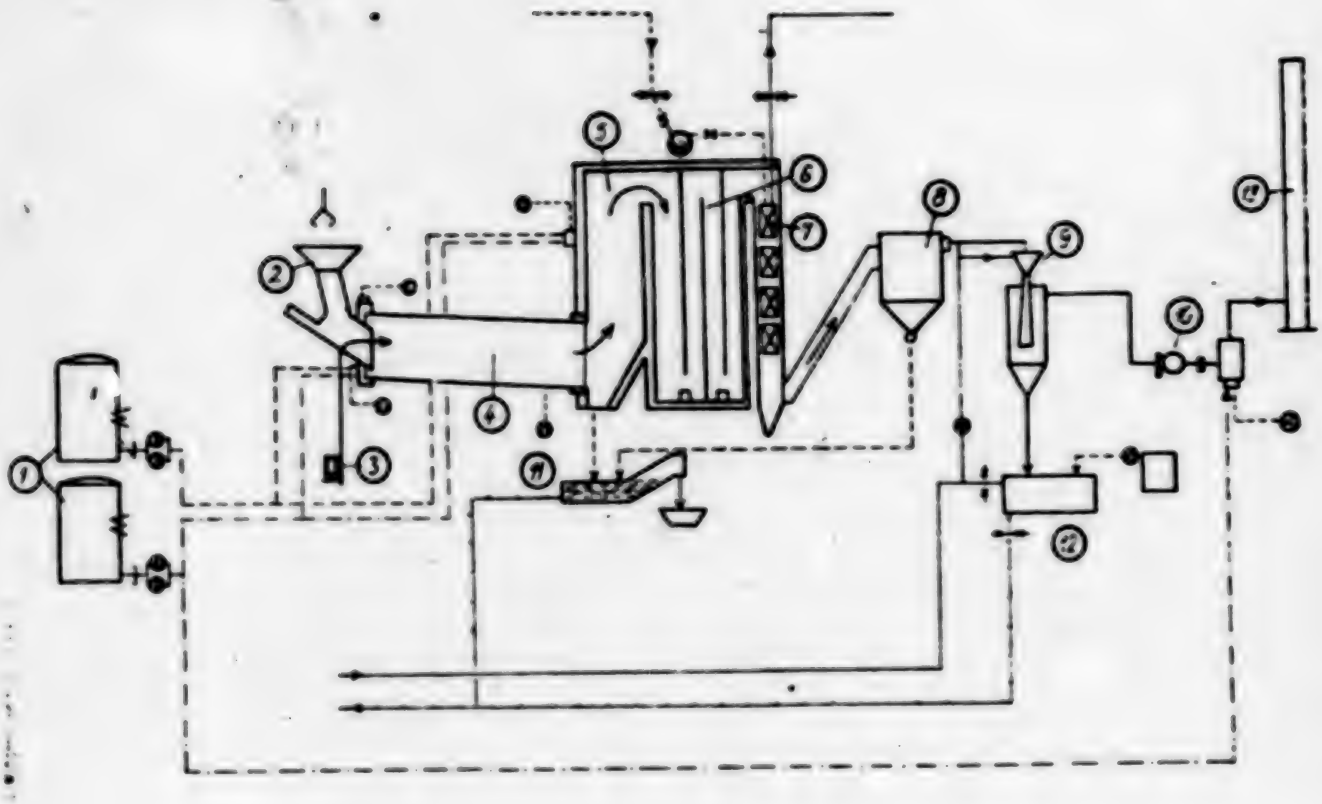

Fig. 8. Schematic drawing of the rotating-drum type industrial waste incinerator

Key: 1. Waste-solvent storage
2. Storage of sludge and solid matter
3. Feed of waste in drums
4. Rotating-drum furnace
5. Afterburning chamber
6. Dust precipitator
7. Heat exchanger
8. Dust-precipitating cyclone
9. Wet scrubber
10. Suction fan
11. Wet-slag collector
12. Gas-scrubbing liquid container
13. Chimney

Control Service. Its tasks include the monitoring of the production units and other contamination sources in three shifts. In addition, it acts in an

advisory capacity regarding establishing responsibility for any deficiencies. Also, it maintains continuous contact with the appropriate authorities. To make its work simpler and more exact, we presently develop and install a telemetric measuring network system, of which the information is transmitted into a data-acquisition center, so that the labor requirement of the supervisory process is significantly reduced.

Manuscript received 26 March 1979.

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ENVIRONMENTAL CONTROL MEASURES IN THE PHARMACEUTICAL INDUSTRY

Budapest MAGYAR KEMIKUSOK LAPJA in Hungarian Vol 34 No 9, 1979 pp 471-473

[Article by Sandor Dualszky, Kobanya Pharmaceutical Works, Budapest]

[Text] The pharmaceutical industry is one of the most dynamically growing industry parts in Hungary. The intensive development that took place was possible only as a result of the introduction of new, highly effective drugs and of the major broadening of the product line (nutrients, plant-protecting agents, cosmetics), and in many instances of major expansion. As a result, any further increase in the production volume of the pharmaceutical industry becomes more and more complicated and there is a greater fire explosion hazard as well as unavoidable environmental contamination.

One of the major goals of the Hungarian pharmaceutical industry is to establish the optimum balance between increased production and protection of the environment. The goal that in developing new technologies we promote not only medical help to sick people but also protect the public from pollution by creating a wholesome environment is generally accepted.

At the same time, we must also keep in mind another major factor: this industry branch can make good use of its tradition going back to the beginning of this century in projecting the image of reliability abroad. Nonetheless, this also means that obsolescent production facilities, equipment, and utilities originating from pre-liberation times represent a difficult inheritance and creates problems in the area of environmental protection that are very difficult to solve.

Specific Circumstances Making Environmental Protection in the Pharmaceutical Industry Difficult

Modernization of the several thousand technological processes used in the pharmaceutical industry, of which the volume approximately doubled since

the liberation, with the main goal of improving environmental protection is a major goal in itself. In addition, we are under an economic and technical pressure to improve our products continuously and to develop new products in frequent intervals; this necessitates the search for more and more solutions to environmental-protection problems.

A further difficulty is created by the fact that we use literally thousands of chemicals to produce our products; thus, our pollution problems and decontamination procedures are very complex.

A factor that makes environmental protection difficult is the fact that most pharmaceutical production processes are—and are likely to remain generally in the future—batch processes, so that we typically contaminate the air and the waters intermittently. This makes the decontamination and other protection measures even more difficult (for example, we have difficulties with the fact that often the air pollution sources are located in a decentralized manner).

There is another factor which creates difficulties and must be mentioned: It is a characteristic feature of the pharmaceutical industry that it creates relatively small amounts of highly valuable product from large amounts of starting material. This necessarily means that much byproduct, waste, and contaminant is generated in the production process.

Insofar as the latter is concerned we should mention that there seems to be little hope that we could ever implement so-called environmentally desirable technologies, generating relatively little waste, in the pharmaceutical industry, although there is an increasing clamor for this. The need for modifying the vast number of processes involved is an unmanageable research/development task which, in addition, would be hampered also by limits necessarily imposed by patent- and license-related restrictions, as well as by the ever-increasing demands for high quality (for example GMP [expansion unknown]).

Of course, we must look for means to recirculate valuable materials as much as possible. We have already taken the initial spets in this direction. At the present time it seems that solvent regeneration is one method which provides advantages, primarily economic advantages.

Finally, a hindrance is represented by the fact that the plants are located in densely populated areas—especially those in Budapest—so that we lack sufficient free space for installing centralized purification facilities such as conventional biological wastewater clarifying systems.

I believe that the foregoing explain why the Hungarian pharmaceutical industry was less successful in terms of environmental protection than some other industry sectors in spite of the fact that it spent several hundreds of millions of forints (100 million forints in 1976-1977 alone) for this purpose.

Organizational Setup of the Environmental-Protection Activities of the Pharmaceutical Industry

The organizational place of the sections handling the environmental protection activities of the individual pharmaceutical plants varies considerably from one plant to another: In two plants the environmental-protection section operates under the jurisdiction of the Energy Department; in another two plants within the Main Technological Department. Two other plants modified their organizational schemes so that they conform to a modern approach increasingly embraced abroad: The environmental-protection activities are performed by a Safety-Engineering and Environmental-Protection Department under the jurisdiction of the deputy technical director.

The Hungarian Pharmaceutical Industry Association performs a coordinating role and offers assistance primarily in connection with the investments and the setting up of international information exchange, insofar as its activities in the field of environmental protection are concerned. Additionally, it acts on behalf of the entire industry branch in connection wial all initiatives concerning environmental protection and represents the interests of its members as needed.

The environmental-protection activities of Kobanya Pharmaceutical Works are laid down in the Enterprise Regulations promulgated in 1976. These regulations describe the tasks assigned to all main departments and departments involved in this matter.

In those enterprises where the environmental-protection and safety activities are combined, a broad-based social activity—not replaceable with any other form of activity in an industrial plant—supplements the work and supports the environmental-protection work, which is primarily regarded as a state task: I refer to the activities of the occupational-safety supervisor of the Trade-Union Committee. This supervisor monitors the environmental-protection activities of the enterprise, which are related to occupational safety, and makes it the obligation of every employee to participate through the Trade-Union Committee.

Among our environmental-protection activities we also have the work of those engineers and technicians in the pharmaceutical industry who were asked to assume responsibility for environmental protection by the appropriate supervisor—similarly to assignments of responsibility for safety—in a single plant unit. These engineers and technicians usually participated in a basic course and passed an examination.

Investments

Most of the Hungarian pharmaceutical plants carry out expressly environmental investments since 1965. Because of the difficulties described above, most of these investments are not of a general character; they are means for eliminating air and water pollution built into technological processes. The fact that biological water purification systems were installed only in two enterprises—Alkaloida Chemical Works and Kobanya Pharmaceutical Works—is primarily the result of the lack of space, to which reference has been made above.

All Hungarian pharmaceutical plants have established a wastewater processing facility combined with solvent-recovery and sedimentation systems. Also, all Hungarian pharmaceutical plants made sure that no wastewater containing toxic materials can enter the sewer system (not even the in-plant sewer system) without prior and effective purification (removal of cyanide, chromium salts, and sulfides).

So far, approximately 230 million forints were spent for such wastewater treatment facilities.

Since our sources of emission are scattered, installation of suitable air purifiers is complicated and expensive. The complexity arises from the fact that we must install a separate air purifier in practically every individual air-pollution source and that there are practically as many methods needed for separation or adsorption as there are impurities. We use adsorption and condensation methods, as well as chemisorption, catalytic separation, and torch-incineration for reducing air pollution.

The methods involving absorption of dust, gases, and vapors in liquids often create new wastewater-purification problems.

So far the pharmaceutical industry has spent approximately 140 million forints for investments aimed to reduce air pollution.

Same as in all areas of the national economy, the matter of waste treatment and disposal is the most difficult one insofar as environmental protection is concerned.

In this field we so far merely built obsolete-type, open incinerators for waste-solvent incineration. Major improvement will only come from the facility established jointly by the pharmaceutical plants in Budapest. This is suitable for the incineration of all kinds of waste. It will cost approximately 250 million forints (estimated).

There is a fourth kind of environmental harm capable of being caused by industrial activities: noise pollution. This is handled in the Hungarian pharmaceutical plants not by the environmental-protection departments. This pollution does not affect the general public, and is properly an occupational-safety matter.

Self-Policing

It is the practice of all pharmaceutical plants to test the wastewaters on a continuous basis. There is an appendix to the appropriate regulations which outlines the tests to be carried out. But full testing is carried out only in those plants where the method of purification is satisfactory in the first place.

The situation is more complicated in the field of air pollution, where there is a lack of sufficiently effective regulations and where there are no standardized methods of analysis. The work performed so far by the Hungarian pharmaceutical plants is more surveying of the situation than anything else; it was commissioned by the plants to outside institutions in most cases, and involved only a small number of major air pollutants.

Technological Development

The manufacturing technology documentation today covers the purification methods, treatment methods, and disposal methods for air, water, and waste in practically all plants.

In developing new technologies, environmental-protection aspects are considered from the laboratory experimentation stage onward, and the technologies are finalized with these considerations in mind.

Even though all Hungarian pharmaceutical plants have a suitable environmental protection laboratory of their own, they both increase their staff and funding, and employ the help of outside institutions. In addition, there is an adequate information exchange among the plants; it is considerably assisted by the Environmental-Protection Branch of the Trade Union of Chemical-Industry Workers and the the Environmental Protection Section of the MKE [Hungarian Chemists' Association].

One of the development themes is the designing of so-called intensified (requiring little space) purification methods in versions suitable for the needs of our industry branch, as is the automation of the purification systems.

We definitely intend to modernize and expand the self-policing network of the enterprises in the area of environmental protection, especially in large-volume production facilities (manufacture of plant-protecting agents and fermentation methods).

We plan to study means for the recovery of solvents that would otherwise escape into the environment (water and air) in all pharmaceutical plants. This matter deserves study in view of its major environmental and economic ramifications. This subject will be a major part of our environmental-protection activities in the years to come.

The development projects outlined above require large sums. Our enterprises can provide them only gradually, especially since their development funds tend to shrink as a result of the liquidity of the present economy. This applies particularly to funds required for the conversion of existing equipment, and equipment and instruments available only by importation from capitalist sources. We must therefore ask the environmental specialists of the industry and the appropriate authorities to be patient. We also hope that the research institutions will try and develop inexpensive methods, hopefully methods which can be implemented from domestic sources.

Training

The development of the proper attitudes is very important both on the national level and on the industrial level. We cannot be satisfied with the fact that practically all pharmaceutical enterprises in Hungary have their environmental specialist engineer. All employees of the enterprises must be conscious of the harm caused by pollution of the environment, of the imposed limitations, and means for improvement. It was in this spirit that some enterprises have already held lectures and courses for

managers and workers. The courses provide uniform training in systematic occupational safety and the basics of environmental protection. In the Kobanya Pharmaceutical Works we carry out this activity with effective help from the Occupational Safety and Welfare Department of the Trade Union of Chemical-Industry Workers. Once the proper curriculum has been finalized, every pharmaceutical enterprise will be interested in introducing such courses.

In conclusion, I thank the technical directors and environmental specialists of the pharmaceutical enterprises for their help in the preparation of this article, especially for data they have kindly provided.

Manuscript received 24 November 1978.

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CSO: 5000

POLLUTION IN CITIES, RIVERS DISCUSSED; NEW MAP SHOWING POLLUTED AREAS

Pristina JEDINSTVO in Serbo-Croatian 7, 10, 12, 13 Nov 79

[7 Nov 79 p 13]

[Excerpt] More and more fish are dying in our rivers, poisoned by phenol which various industrial enterprises discharge into streams. Although this has not yet affected livestock on a large scale, farmers downstream from Jasenovac do not permit their cows to drink from the Sava River. The systematic pollution of our rivers began about 15 years ago. The Mura, Drava, Sava, Kupa, Vrbac, Bosna, Drina, Morava, Kolubara, and many others are polluted. The Sava between Brezice and Sisak, containing waste water from Slovenia and the industrial part of Zagreb, has entered a third category in which its water can hardly be used for irrigation. The situation is similar with other rivers in Slovenia, Bosnia, and Serbia. The experts in Belgrade are concerned not only with pollution of the Sava and Danube from oil derivatives but also the danger of the pollution penetrating into underground water, especially in the Makis region where wells supply water to a good part of Belgrade. Herbicides and pesticides are also poisoning the water.

[10 Nov 79 p 13]

[Excerpts] [The city of] Bor has suffered for a long time from air pollution. It is [located at] one of the largest copper mines in the world. Its situation has not improved even after provision was made to retrieve smoke gas and use it to produce sulphuric acid. The air pollution in Bor has threatened an area 8 kilometers wide and 17 kilometers long, which has been largely stripped of trees.

Trepca is also a big air polluter; located in Kosovska Mitrovica, it discharges 65 kilograms of lead waste daily. The village of Malo Rudare [located in the mining complex] was so polluted, it had to be abandoned.

There are 42 cities in which the air pollution level is rated critical, 94 which are rated moderately polluted, and 188 rated normal. The most

polluted in Serbia are Bor, Kosovska Mitrovica, Nis, Sabac, Belgrade, Mladenovac, Armandjelovac, Loznica, and Zemun; in Bosnia-Hercegovina--Zenica, Sarajevo, Catici, Ilijas; in Croatia--Zagreb, Split, Sisak, and Rijeka; in Slovenia--Jesenice, Kidricevo, Anhovo, Celje, Crna Mura, Hrasnik, Medvode, Ravne, Sostanj, Store, Trbovlje, and Zagorje; in Macedonia--Skopje, Bitlj, and Bogosovac.

It need not be pointed out that air pollution causes respiratory illnesses on a wide scale also among children. In Savski Venac Opstina of Belgrade it was found that 76 persons out of 10,000 suffered from respiratory illnesses. In Smederevo there are twice as many such cases as in Pozarevac which is not polluted.

[12 Nov 79 p 12]

[Excerpts] Although it is not well known, a map of Yugoslavia has been made at the request of the Federal Assembly which shows air pollution according to opstinas. Specialists of the Federal Hydrometeorological Institute have used data from 126 measuring stations throughout the country, from health inspection services at all levels, weather data, data on heating methods, etc. on the basis of which this map has been made, showing for the first time the pollution in individual settlements of Yugoslavia. Almost one-half the population of Yugoslavia lives in only 2 percent of the total area. There are also nearly 2 million cars in this [small] area. In some of our cities and industrial centers pollution is 20 percent higher than permissible. Large thermoelectrical power and heating plants discharge up to 20 times more sulfur dioxide daily than is permissible.

According to the [mentioned] map on pollution, 482 cities in our country have critical air pollution levels for part of the year.

[13 Nov 79 p 12]

[Excerpts] In Yugoslavia 138 settlements are in the initial stage of pollution: 26 in Slovenia, 29 in Croatia, 30 in Bosnia-Hercegovina, 5 in Montenegro, 41 in Serbia, 7 in Macedonia. There are 190 settlements with clean air in the country; e.g., 30 in Bosnia-Hercegovina, 96 (out of 179 cities) in Serbia, 14 out of 30 cities in Macedonia, only 38 out of 105 cities in Croatia (these are mostly on the Adriatic islands, Istria, Lika, etc).

Of 2,000 samples of milk and milk products, fats, meat, canned fruit, vegetables, bread, and other food products taken in 23 cities, only 17.5 percent did not contain traces of pesticides.

CSO: 5000

BRIEFS

JUZNA MORAVA RIVER POLLUTION--Official measurements have shown that the level of pollution of the Juzna Morava River is critical. It empties into a large canal into which almost all waste water is discharged from the factories along its banks. Swimming is prohibited in most of the river and doctors warn against even stepping into it. Almost no one has heeded the warning, however. This past summer the papers reported a great pestilence afflicting fish not far from Vladicin Han; fish totaling almost 30,000 kilograms in weight died. Fishermen rose up and demanded that those respponsible be penalized. However, this was never done, although it is known who they are. Leskovac, a textile city, joined the ranks of the most polluted cities in the country about 10 years ago; some say it is only second to Sarajevo. In some cities in southern Serbia, such as Bejanovac, almost 230 persons suffered from hepatitis as a result of bad water just last year. In factories in Leskovac, Vranje, Bujanovac, and other places with the worst polluters, money is not available to buy necessary filters. [Excerpt] [Pristina JEDINSTVO in Servo-Croatian 21 Nov 79 p 7]

POLLUTION IN PLJEVLJA--On the basis of 2,000 analyses of air pollution levels in the Pljevlja area [Montenegro], the hydrometeorological institute of Montenegro stated that dust particles are three times above the permissible level and the smoke level is four times above "normal." What is to be done to prevent smoke and dust from the cement factory which is almost in the center of the city and from the nearby coal mine? This question has become increasingly sensitive as the migration of the population from Pljevlja has become more noticeable. Measures are now being taken. An agreement with the coal mine obligates it to recultivate and restore stripped land. The "Velimir Jakic" forestry combine and Pljevlja thermoelectric plant are obligated to reforest the area around the city. The cement plant must seriously consider the everyday operation of electric filters and other air-purification equipment, and will have to plant a special tree barrier and build a protective wall around the plant. The city's heating plant must be moved outside the city. The cement plant and coal mine must also help to relocate 13 families from the Doganje settlement within the cement plant complex. The self-management interest community for housing and communal affairs is to work out projects to obtain collectors for channelling off and purifying waste water by August 1980; this action will also involve all organizations which discharge waste water into the Dehotina River. [Excerpt] [Belgrade BORBA in Serbo-Croatian 6 Dec 79 p 9]

CSO: 5000

MERCURY CONTAMINATION IN MORON, FALCON DISCUSSED

Caracas EL NACIONAL in Spanish 5 Nov 79 p D-9

[Article by Miguel Rivas Enez]

[Text] Puerto Cabello, 4 Nov (Special)--This region's Municipal Council is organizing a forum to discuss the problem of mercury contamination in the zone of Moron and the eastern coast of the state of Falcon.

This information was released by Moron's Committee for Protection Against Industrial and Environmental Contamination, which is headed by Orlando Urquiola, and whose members are Manuel Dominguez, Marcos Ramirez, Manuel Villanueva, Juan Ramon Reyes, Manuel Vilaro and German Pulgar.

A report by the mentioned committee opens with an expression of thanks to the College of Engineers of the state of Carabobo, and especially to its chairman, Pedro Salovey, and his colleagues Edgardo Parra and Nelson Estaba, for the personal interest they have taken in the mercury contamination problem produced by the PEQUIVEN [Petrochemical Company of Venezuela] sodium chloride plant. It also expresses the committee's profound thanks to the mass media, and especially to EL NACIONAL, for the support they provided in reporting and broadcasting information on the matter.

The committee's report adds that an article published by a prestigious Caracas magazine, on the confidential report by the Ministerial Committee for the Study of the Mercury Contamination Problem in the Moron Region, contradicts the statement by PEQUIVEN's management that no danger exists as a result of mercury contamination. It further adds that, of 132 workers examined, 15 had 30 micrograms of mercury per liter in their bloodstream, 13 had between 30 and 50 micrograms per liter, 27 had up to 100 micrograms, 19 up to 150 micrograms, 10 up to 200 micrograms, and 23 had more than 200 micrograms of mercury per liter of blood.

Examination of regular consumers of fish from that region and of residents of the region showed that 17 persons had between 100 and 119 micrograms of mercury per liter of blood, 3 had more than 120 micrograms per liter, 9 had more than 130, and 9 had more than 140 micrograms per liter of blood. The

most desired fish from the Triste Gulf, the most marketable and those with the greatest gastronomic appeal, are those weighing between 2 and 4 kilos, with a mercury concentration of 0.50-1.2 parts per million: swordfish, sea bass, jurel, porgy, hake, "curbinas," and grouper. The tolerable limit, according to the World Health Organization, is 0.50 parts per million.

The members of the Moron committee consider that the results of the ministerial committee's report, besides refuting the statements made by the PEQUIVEN management and pointing out the magnitude of the existing danger, demand the utmost diligence in setting up adequate sanitary and epidemiological controls in the region and fully justify the report's call for a nationwide alert to avoid Venezuela's becoming another Minimata as a result of mercury contamination.

The committee members state that, cognizant of the existing danger to public health and in defense of the workers and former workers of the sodium chloride plant, as well as of the general community, have made a formal complaint to the Office of the Public Prosecutor of the Republic, which will soon open an investigation to which it will certainly appoint an attorney from the Office of the District Attorney of the region. They also state that the Municipal Council of the Puerto Cabello district is organizing a Cabildo Forum, in which it will be proposed that the Municipal Council proceed to take appropriate legal action, as representatives of the affected community, exercising the special powers granted by the Organic Law to the Municipal Administration.

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CSO: 5000

CONCERN SHOWN FOR INCREASING DROUGHT AREAS

Windhoek THE WINDHOEK ADVERTISER in English 20 Dec 79 p 3

[Article by Anita de Kock]

[Text] CATTLE and sheep farmers throughout SWA are concerned about the lack of rain this year. And if it doesn't rain within the next two months it will be disastrous for some farmers.

According to the Weather Bureau at the J G Strijdom Airport no rain is expected in the near future.

In the meantime certain parts of SWA have been declared drought-stricken districts. These are the Outjo, Karasburg, Karibib and Okahandja districts. The farmers west of Okahandja are mainly affected by the drought.

Mr Henning Snyman, Secretary of SWALU remarked that the situation was serious and more parts might be declared as drought stricken. "In the Aroab district hardly any rain has fallen and last year it had only 18 mm of rain", Mr Snyman said.

The Advertiser contacted some of the farmers in those areas to establish how the drought is affecting them. Mrs R W van Zyl of the farm Otjimbojo in the Karibib district said the situation was not so serious yet. "We still have enough grazing for our cattle, but if it doesn't rain soon, we might run into trouble."

Mrs van Zyl said some of her neighbours have to buy lucern and mealies to keep their cattle and sheep alive.

On the farm Kaltenhausen in the Tsoabis district the situation was the same. The Kurz family farm mainly with sheep. Their grazing is still sufficient for their 2000 sheep. "But not for very much longer," said Mr Otto Kurz.

In the Wilhelmstal district the situation looks bleak. We spoke to Mrs H G Jentsch of the farm Claustal and she sounded worried.

"We have a farm of 5 000 hectares and only 50 head of cattle left. The rest we had to sell or move to other farms where there is sufficient grazing.

"For the past three years we hardly had any rain. A few drops fell in early November and that gave us hope for a good rainy season. But that hope has since diminished."

The worst the Advertiser encountered was Mr Gert Jordaan of the farm Cypress in the Outjo district. Mr Jordaan said he had only about 400 head of cattle left. Some of them he had to move to other farms in the area.

"But what is worse is that the contract for my cattle on the other farms terminates at the end of next month. And where do I go with my cattle then?"

Mr Jordaan said 150 mm of rain fell on his farm last year. Two years ago it was 200 mm. In 1976, 150 mm of rain fell.

And this year? "This year 19 mm of rain fell on the one half of my farm. Not a single drop has fallen on the other half as yet," said Mr Jordaan despairingly.

According to Mr Jordaan the Meat Board gave preference to the Outjo farmers for marketing and export. Apparently these farmers who did not suffer so much from the drought.

Farmers such as Mr Jordaan had to sell their cattle before July thus losing out on the offer.

"The situation here is critical. Every day we look up at the sky but the clouds come and go. No rain for us."

Someone put it aptly — "There is not even enough grass on my farm to light a pipe."

CSO: 5000

BRIEFS

KARIBA RISING RAPIDLY--One floodgate will be opened at Kariba on December 26, the Central African Power Corporation said in Salisbury yesterday. The gate will be half opened at 10 a.m. and fully opened at 3 p.m. on that date. The spokesman said there had been a very high rainfall over the entire upper and lower catchments and the level of Lake Kariba was rising rapidly. One gate spilling would continue until further notice. [Text] [Salisbury THE HERALD in English 14 Dec 79 p 5]

CSO: 5000

POLLUTION PROBLEM HAUNTS CHILANGA

Lusaka TIMES OF ZAMBIA in English 13 Dec 79 p 5

[Text]

CHILANGA Cement Company has drawn up plans to eliminate dust emitted into the atmosphere from its kilns at Ndola works to control air polution.

A spokesman for the company said this job had been delayed due to lack of funds, expertise and spare parts.

The spokesman was reacting to accusations by the council that Chilanga Cement had not heeded plea to control air polution from its Ndola works.

The council had threatened to take legal action against the company and it urged Government intervention to settle the wrangle so that effective control measures could be applied.

The company already has acquired the electro precipitators (filters), the spokesman said and added: "But this requires sophisticated additional instruments, spare parts and qualified operators before they can start operating."

He said some of the equipment has already been made, but a local firm which was to bring this into the country did not have adequate foreign exchange.

Although the dust was not harmful to life, he said, every effort was being made to eliminate it from the atmosphere.

He said the company was losing a vital amount of raw material through the emission of the dust.

The company was determined to reclaim it by introducing the filters, he explained.

The spokesman confirmed there had been communication between Chilanga Ndola works and Ndola council's health department, but denied any knowledge of his company being sued.

He said Chilanga Cement had not offered negative response to the council's approaches on this matter.

He said it had been explained that the company's financial position had been seriously affected by the recession in the building industry. Zana.

NOISE REDUCTION DEVICE FOR TETS DEVELOPED

Moscow ENERGETIK in Russian No 9, Sep 79 pp 34-36

[Article by engineer M. I. Imbritskiy, Soyuztekhenergo, Moscow: "Noise Abatement in the Work of Fixtures"]

[Text] The noise pressure level--the noise generated in the work of safety and throttling fixtures with which power generating units are extensively equipped--considerably rises with the growth of the parameters and unit capacity of power generating equipment. For example, at the 800 megawatt unit of the Slavyanskaya GRES the noise level generated in releasing the main safety valve for fresh steam (Q = 500 tons per hour) reached 112 decibels[1] at a 250 meter distance.

The noise around the fixtures in choking the flow of the medium from 42 to 14 kilograms per square centimeter reaches 110-120 decibels. At the Tbilisi TETs, as a result of the strong noise generated in the work of the throttle valve of the ROU [pressure-reducing and cooling unit] of the Barnaul Boilers Plant, ROU productivity had to be lowered by one-half.

Noise has an adverse effect on the servicing personnel. Loud noise could cause dizziness, nausea, headaches, and temporary loss of hearing.

Prime attention should be paid to the problem of reducing the noise level, particularly at TETs located in the immediate vicinity of residential premises.

Despite the importance of the problem, efforts to reduce the noise generated by the operation of one of the main noise generating sources--fixtures--has been insufficient and the electric power plants are forced to design and manufacture themselves a variety of noise reduction systems.

Noise reduction systems which reduce the noise level in the work of the equipment to admissible levels (65-80 decibels) have been developed by design and repair organizations (TEP [All-Union State Institute for the

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1. Noise level figures in this article are according to scale A.

Planning of Electrical Equipment for Heat Engineering Installations], PKB [Planning and Design Office] for power systems, and Yuzhenergoremont) and by electric power plants.

At the Darnitskaya TETs, Kievenergo, the window-glass in the boiler shop broke whenever the main safety valves of the pulse-safety system were turned on, for the exhaust pipes had been led horizontally through the glass-fitted wall. Placing the pipes above the ceiling of the boiler shop would have required a substantial outlay of large-diameter pipes (D = 300 mm), entailing great installation difficulties. For this reason, the electric power plant developed a system (Fig. 1) which called for the installation of throttling fixtures at the exhausts and paper guides to protect the windows from the exhaust jet.

The noise level in the operation of safety valves was reduced substantially following the reconstruction of the exhaust systems of five TP-170 boilers. The exhaust pipes of the safety valves of PK-19 boilers at the first section of the Cherksskaya TETs were similarly reconstructed.

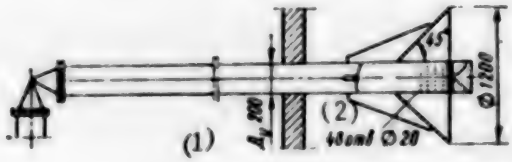

Fig. 1. Noise abatement system developed at the Darnitskaya TETs

Key: (1) Diameter (2) Vents

The two-step throttling system for the exhaust pipes of safety valves for fresh steam and steam released from the hot intermediary overheating of TPP-210A boilers of the Tripolskaya GRES has the following advantages: The reaction effort of the exhaust on the valves and support structures is virtually excluded; the noise level is reduced; the layout of the pipes is simplified and the number of mountings and their load are reduced correspondingly.

A system for noise abatement at TGMP-314A boilers in the operation of main safety valves was developed for the Kiev TETs-5 by the PKB PO [Planning Section] of Kievenergo (in coordination with the Krasnyy Kotel'shchik Planning Section). The following was taken into consideration: There was no possibility to lead the exhaust steam pipes through the wall of the boiler shop because of the presence of jibs and of an outside gantry crane above the level of the location of the valves; the diameters of the exhaust pipes of the fresh steam safety valves were determined in accordance with the diameter of the flanges of the main safety valve D = 250 mm; in order

to ensure a maximum handling capacity of the pressure valve after it we used p_2 = 66 kg per square centimeter. $(p_2 \leq 0{,}25\ p_0)$.

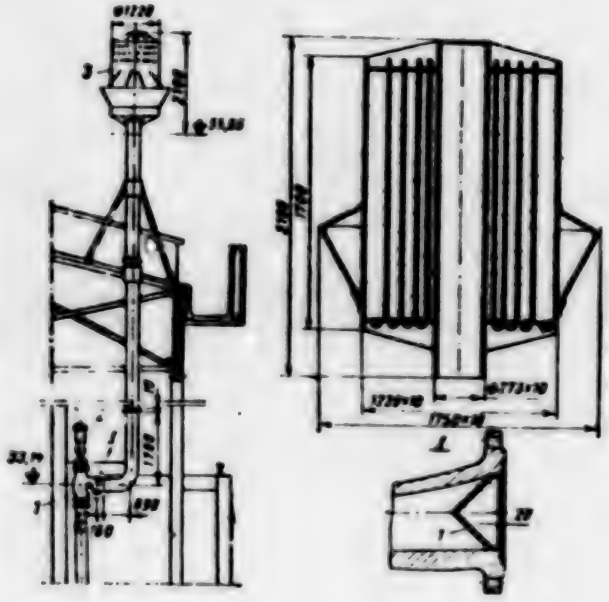

Fig. 2. Noise abatement system at the steam exhaust main safety valve developed at the Kiev TETs-5

Figure 2 shows the design of such a system. A cone disc 1 with holes used to break down and reduce the steam jet is installed in the diffusor at the outlet of the jet from the main safety valve.

The throttling disc 2, capable of handling 240 tons per hour steam for an estimated pressure directly behind the safety valve (before the cone throttle) of 66 kilograms per square centimeter is installed at the outlet of the steam jet in the vertical pipe D = 250 mm.

The maximum steam pressure in the vertical steam pipe D = 250 mm is based on the resistance of throttling probe 3 at the exhaust, equalling 39 kg per square centimeter with a discharge of 240 tons per hour steam. The maximum velocity of the steam in the pipe is 110 meters per second. The throttling head is the basic element of the structure. It includes six throttling levels consisting of coaxial segments of standard 1,580 mm pipes of increasing diameter.

The pipe sections dampened with butt ends have perforated walls which make possible the gradual reduction of the pressure from 39 kg per square centimeter to the atmospheric level. Each throttling step ensures the expansion of the steam to a pressure close to critical, thus transforming the steam jet pressure energy into kinetic energy killed in the interpipe area as the

steam flows to the next throttling step. The system was considered by the Technical Council of the State Combustion Technical Supervision Administration and was given a positive rating.

Noise dampeners, whose design is shown on Fig. 3, were installed at the fresh steam safety valve exhaust pipes of boilers TGM-444 (500 tons per hour, 140 kg per square centimeter, 560°C) of the Rostov TETs-2. The steam expands at the input of the verticle cylinder and, coiling along the inner surface of the cylinder, is channeled toward its open end. Approaching it, it is partially obstructed and loses its velocity.

The steam is released into the air through a compact large diameter ring. This makes it possible to considerably reduce its velocity and pressure and, consequently, the noise level.

According to the operational personnel, following the installation of silencers the noise dropped considerably and did not exceed the level of the general noise generated by the thermal power equipment.

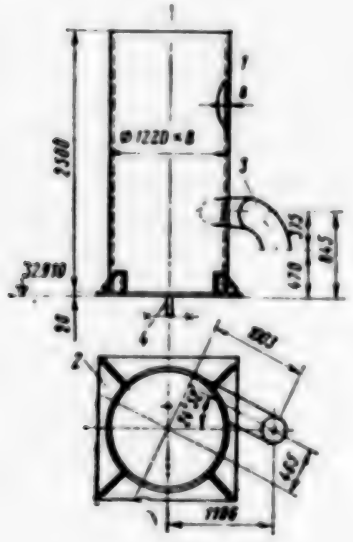

Fig. 3. Noise silencing system installed at the Rostov TETs.

The various noise silencer designs developed by the TEP use the method of separating the steam jet into smaller jets and reducing the velocity of the steam at its release in the air, and the use of sound absorbing materials in some structural variants.

Structure designs shown on Figs. 4 and 5 are of the greatest interest. In the noise silencer (Fig. 4) noise reduction is achieved by breaking down the steam flow into individual jets of considerably reduced power.

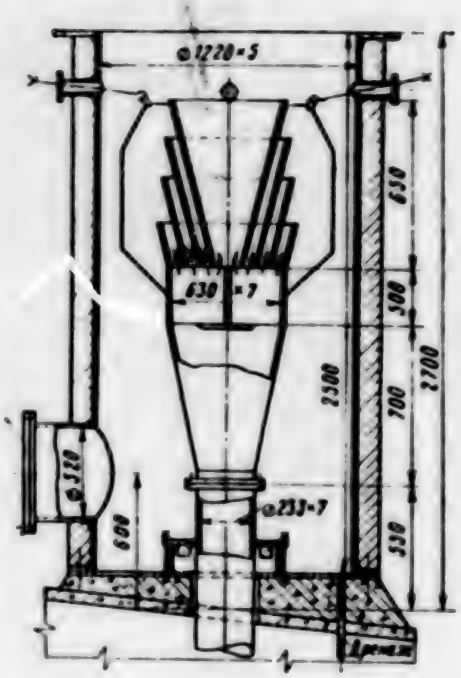

Fig. 4. Noise silencers of exhaust boiler pipes developed by the TEP.

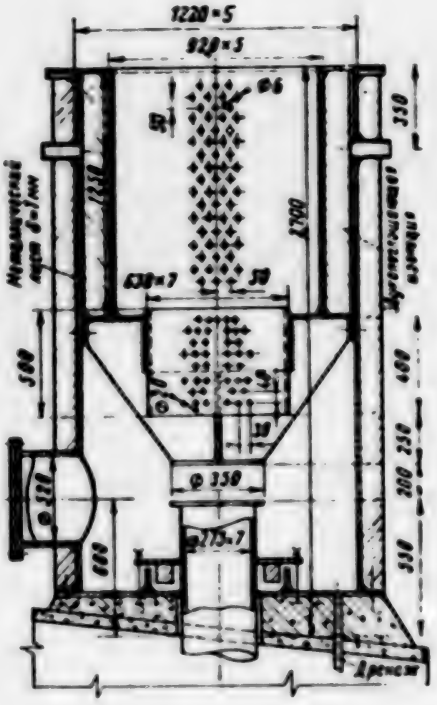

Fig. 5. Noise silencers of exhaust boiler pipes developed by the TEP.

The noise silencer consists of a set of diffusors welded to a 630 by 7 mm diameter pipe with an adapter and flanges for coupling with the exhaust of the outlet pipe 1,220 by 5 mm, insulated with noise absorbing material.

From the exhaust pipe the steam is channeled into the inner 630 by 7 mm pipe, expanded, and restrained by a built-in screen. Further on, emerging from the diffusors to the outside cylinder with a diameter of 1,220 mm, the steam is expanded again. As a result of the increased cross-section in reaching the atmospheric pressure, the velocity and pressure of the steam decline as a result of which the noise energy is reduced. According to computations the steam pressure in the inner chamber is 1.8 kg per square centimeter; behind the diffusor it is about 1 kg per square centimeter. Steam velocity at the outlet of the 1,220 by 5 mm pipe equals approximately 144 meters per second.

The noise abatement system shown on Figure 5 consists of a perforated pipe with soundproof insulation and a screen. The noise is reduced as a result of the increased cross-section, the reduced velocity at the steam outlet, separation of the flow into individual jets of considerably lesser power and the absorption of the noise by soundproof material placed between the inner perforated 920 by 5 mm pipe and the external 1,220 by 5 mm pipe.

Leaving the exhaust sleeve the steam is directed into the first container restricted by an outside pipe 1,220 by 5 mm in diameter. It is expanded and restrained by a built-in screen. From the container some of the steam goes through the walls of the perforated 630 by 7 mm pipe and, partially bending the screen, through the 630 mm diameter pipe, flows into a 920 by 5 mm pipe, expands, and is released in the air at a velocity of 274 meters per second and a pressure of 1.05 kg per square centimeter.

Together with the VTI [All-Union Institute of Heat Engineering] imeni Dzerchinskiy, the Yuzhenergoremont enterprise developed for the Kishinev TETs (BKZ-120-100 boilers) a noise silencer in which the noise is reduced by the gradual throttling of the steam, a reflection from the wall and bending of the steam jet and the dispersion effect of the openings.

The design of the silencer is the following: A pipe with a cap is welded at the end of the steam discharge pipe. The pipe contains a number of elongated perforations the total area of whose clear opening equals double the size of the clear opening of the steam exhaust pipe. The direction of the steam changes by 90 degrees compared with its initial direction. Coming out of the openings the steam drastically expands and loses velocity.

Through the openings in the cap, changing its direction, the steam goes into a second and bigger container. Once again the steam expands and its velocity is reduced as it flows through the valve, and so on. This noise silencer has five strainers.

In addition to the noise caused by the safety installations the throttling of water and steam, particularly along the recirculation lines of the feeding electric pumps of medium, high, and increased pressure, creates a considerable amount of noise.

A number of noise abatement methods may be used: setting the noise source at a distance in which the level of the sound pressure does not exceed admissible values; insulation of the noise source and use of special silencers and diffusors.

Also useable is a method based on the direct correlation between the range of pressure fluctuations in the environment and the range of fluctuation of transmitting surfaces. In this connection, thickening the walls of pipes and of various hydraulic systems considerably reduces noise transmission.

The level of sound pressure is reduced by four decibels for each 10 mm of wall thickness.

In order to protect from noise control equipment of the installations a variety of soundproof and sound absorbing materials are used in the manufacturing of partitions, screens, and sleeves. The main effect of sound insulation materials is based on sound reflection.

Felt, wood, plastics, fiberglass, and special mastics or gums have sound insulation properties. Best results are obtained in the use of multiple layer linings.

Workplaces may be partitioned with movable screens to protect control devices from the noise. Such screens are made of glass fabric (two-three layers) supported by a light frame made of mineral staple piles. Such a screen could reduce the noise level by approximately 20 decibels.

The control instruments which generate strong noise could be enclosed in sealed and thick sleeves made of sheet materials lined on the inside with felt, mineral wool, or fiberglass. A double sleeve with an air layer 8 to 10 cm thick reduces the noise level by as much as 30 decibels. Mixed sound absorbing lining made of mineral wool and lead could reduce the noise level by 15 decibels; its double thickness reduces the level by up to 30 decibels.

Such noise abatement methods are used essentially whenever the noise level must be reduced by 15 to 20 decibels. Should the noise level as the medium flows through the control instrument exceed 100 decibels, such methods become uneconomical, for which reason special silent control instruments must be used in the systems.

Sredaztekhenergo has developed and experimentally tested with operating equipment in a number of thermoelectric power plants a throttling system of a new design--a slotted throttle.

The system is a cigar-shaped cylindrical insertion permanently fastened to the pump recirculation pipelines. A round slot has been left in the throttle for the passing of the water flow, whose length and cross-section are estimated to ensure the necessary drop of pressure in the slotted throttle for a given water discharge through the circulation line.

5003
CSO: 5000

SCIENTISTS DISCOVER CAUSES OF TIEN SHAN EARTHQUAKES

Tallin SOVETSKAYA ESTONIYA in Russian 29 Aug 79 p 1

[Text] Colossal compression of the Earth's crust is a cause of frequent earthquakes in the Tien Shan Mountains. This is the conclusion reached by scientists of the Seismology Institute of the Kirgiz SSR Academy of Sciences.

It was established with the help of laser light rangefinders and other high-precision instruments that the mountain system is gradually growing narrower. It is being squeezed from the southeast by the Tarimskaya plate, which is creeping forward at a rate of 6 millimeters per year, and the rigid Central Kazakhstan plate is serving as the anvil. Blocks of the Earth's crust making up the Tien Shan Mountains are rushing against one another, slipping over each other, and breaking down within this gigantic vise. Earthquakes are a natural means for relieving the arising stresses.

We have studied the mechanism behind deep tectonic processes in this region enough to predict, with a high probability, the place and force of subterranean jolts, reported the institute's director, F. Yudakhin, to TASS reporter A. Maslennikov. The greatest stresses and, consequently, the largest earthquakes occur most often where deep fractures delimiting the blocks cross at large angles. Scientists are maintaining systematic observations in dangerous places, recording even the slightest movements of the rock. They have drawn up a regional seismic map of the Kirgiz SSR. It shows the outline of the earthquake zones, and it indicates their expected intensity and periodicity.

11004
CSO: 5000

WASTE RECYCLING PLANT GOES INTO OPERATION

Moscow EKONOMICHESKAYA GAZETA in Russian No 44, Oct 79 p 19

[Article by G. Budanov, Deputy Chief, Press Center, USSR Ministry of Industrial Construction: "Wastes Become Raw Materials"]

[Text] A plant processing domestic wastes into compost (planned by the Belkommunproyekt [not further identified] Institute) recently went into operation in Minsk.

The plant's production complex includes a receiving department, a main building, a grinding and sorting building, and a storage building in which compost is stored in heaps to ripen.

"A high degree of mechanization and automation is a distinguishing trait of our operation," says Vasiliy Mikhaylovich Klebanovich, chief of the biothermal processing shop. "Instruments help the dispatcher to monitor all production processes--from unloading of the raw material to acquisition of the end product."

The biothermal shop, the four huge rotary kilns of which recall a cement plant, may be said to be the heart of the enterprise. But there is one difference: the lining is substituted in the biological processing drum by large knives secured at a particular angle--this makes it easier to break down the trash.

The plant is designed to process 400,000 cubic meters of domestic wastes per year. The latter can be used to produce 60,000 tons of compost.

Attaining its output capacity is not an easy thing to do. This task had been complicated at this plant by the fact that the equipment had not always corresponded to the unique features of the production operation. The Leningrad VNIIkommunmash [not further identified] Institute helped out the Minsk workers. The experimental model they developed of a pulverizer with a vertical shaft, the KM-01, is working successfully.

It was also discovered that the planners had not thought of everything either. The operators noticed that the electromagnetic separators were not

trapping iron objects well. It was decided to install additional separators, though right at the beginning of the production process--before biothermal processing of the waste. As a result the volume of scrap metal collected has increased.

The plant is working and growing. Builders of Construction Administration No 25 of the Minskpromstroy Association are erecting the enterprise's second generation--an incinerating station--jointly with Czechoslovakian installers. Why is such a station needed? Because the incoming trash is so heterogeneous. The quantity of wastes not suitable for composting is increasing, to include leather, rubber, plastic, and other such articles which for the moment must be carried away to the dump.

11004
CSO: 5000

PENALTIES FOR ABUSE OF NATURAL RESOURCES DESCRIBED

Moscow SEL'SKAYA ZHIZN' in Russian 7 Aug 79 p 4

[Article: "For Violation of the Rules of Nature Protection"]

> [Text] What is the order of forfeiture of bonuses for failure to complete plans and measures aimed at nature protection, and for failure to comply with the norms and rules of using natural resources?" asks I. Kozodub from Poltavskaya Oblast.

A resolution of the USSR State Committee of Labor and Social Problems and the Presidium of the AUCCTU published 29 May 1979 established, for all sectors of the national economy, the following order of forfeiture of bonuses for failure to complete plans and measures aimed at nature protection and for failure to comply with the norms and rules of using natural resources:

a) directors (chiefs, managers), their assistants, and the chief engineers of enterprises and organizations, as well as workers guilty of failing to complete plans and measures aimed at nature protection (to include failure to make treatment plants operational so as to prevent contamination of fishing waters) forfeit part or all of the bonuses they would receive for the principal results of their economic activities.

Workers forfeit part of their bonuses (but not less than 25 percent) for failure to complete set plans and measures in relation to one or more indicators. For failing to complete plans and measures aimed at nature protection and foreseen by state plans for the USSR's economic and social development, workers forfeit all of their bonuses until such time that these plans and measures are completed; completion of the latter must be confirmed by agencies having the responsibility of monitoring them.

All or part of the bonuses are forfeited in the accounting period in which the plans and measures of nature protection had not been completed;

b) executives and other enterprise organization workers guilty of failing to comply with the norms and rules of using natural resources forfeit all

or part of the bonuses they would receive for the principal results of their economic activities.

The decision to forfeit bonuses is made on request of agencies monitoring compliance with the norms and rules of using natural resources in the appropriate categories of natural resources.

Bonuses are forfeited fully or partially for failure to comply with the norms and rules of using natural resources in that accounting period in which reports of noncompliance with these norms and rules had been submitted.

Executives forfeit all or part of their bonuses on decision of the chief administrator of the higher organization, on coordination with the appropriate trade union committee, while other workers forfeit their bonuses on decision of the director of the enterprise or organization, on coordination with the trade union committee, irrespective of whether or not the workers are subjected to disciplinary or other forms of punishment as established by law.

11004
CSO: 5000

'KHIMVOLOKNO' DIRECTOR ON WATER POLLUTION

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 26 Oct 79 p 2

[Article by L. Marakhovskiy, Khimvolokno Association director, Kalinin: "Protecting Nature"]

[Text] Our enterprise maintains extensive business relations. Kalinin silk is shipped to weavers in Moscow, Kutaisi, Alma-Ata, and Vil'nyus; staple is sent to Ivanovo, Minsk, and Krasnodar, while tire manufacturers in Yaroslavl' and Leningrad cannot function without our cord. We use a great deal of Volga water--400 liters per kilogram of output. You may compute the amount used over 24 hours, bearing in mind that within that period we shall produce 170 tons of staple. An entire river! Hence our main concern is to save water: take less and discard less, the more so since we are located in the upper reaches of the Volga.

But how to do it? We decided, to begin with, to equip with recycling facilities the local water circulation systems. In my view, we were quite successful. Today one-half of our water is recirculated. Yet, this is only one-half. What then? We are building a system which will return conditionally for industrial use cleaned water flows following the flushing and cooling of the equipment and after showers. This amounts to no more and no less than 40,000 cubic meters per day.

Another one of our concerns is to return the water as clean as possible. Without exaggerating I could say that we are accomplishing this with a great deal of difficulty. The point is that we were the first among the chemical workers to apply the inexpensive lime water treatment method. The treating equipment was installed on the surface rather than in the ground. This is entirely justified, for the area around us is swampy and we would have had to pump out a large quantity of water and thus take years to complete the project. Furthermore, we borrowed from the power workers a water sedimentation method based on the floating precipitation principle. This enables us to reach a high degree of water purity which was precisely our concern.

The idea was good but the mastering of the installations was inadequate. To determine the nature of the snag we undertook a detailed systems analysis. It became apparent that a number of construction materials were unsuitable. In the course of the tests conducted by the Leningrad designers everything seemed normal. Yet, here we dealt with a volume of tens of thousands of cubic meters of water per day. The protective lining was unable to withstand its load and broke down.

We undertook its reconstruction almost immediately. We made new shielding and changed distribution lines. In addition to the design stipulations we installed special flow gauges at all precipitation tanks and filters. This enabled us to control the water treatment not in general but specifically along each section of the system.

Gradually matters improved. Today the content of harmful substances in sewage waters is consistent with the norms of a fish breeding reservoir. In my view, this definition is self-explanatory.

The concept of environmental protection includes the condition of the air basin over the city, for which reason we are also extensively involved in reducing to a minimum harmful emissions in the atmosphere. In this case our principal enemies are carbon bisulphide, hydrogen sulphide, and sulphurous gas. To be more specific, the latter no longer worries us, as we have eliminated it. Our struggle against the first two, with the help of special treatment systems, is quite successful. This is not a one-time project. It is carried out on a permanent basis, as confirmed by the annual lowering of environmental pollution indicators.

Our accomplishments in this area are of interest to our colleagues in the sector and the chemical workers in other countries. Swedes, Germans, and Americans come to learn from us. The point is that we have been involved in the development of methods for the treatment of ventilation emissions and industrial effluents for the past 20 years, having been one of the first in the country to initiate it along with a number of institutes. Furthermore, our enterprise has become an experimental base for the testing of treatment methods.

At this point the principle of mushrooming came into play. With every passing year we improve, "refine" our treatment systems. It seems only yesterday that our rationalizers raised the productivity of systems for tapping carbon bisulphide, converting it to the so-called two-step method, yet our colleagues have already become quite familiar with it. We developed a new process for slaking lime at treatment installations, reducing outlays by 15-20 percent. However, this too is old news. Using a new catalyzer we quite recently developed, again for the first time in the sector, a most reliable method for the elimination of hydrogen sulphide from air emissions which has already triggered the interest of chemical workers.

However, this is not to say in the least that we have resolved all our problems. For example, we have still not organized the final stage of the water treatment--clarification--by running the water through quartz sand. The trouble is that after three months use the sand become "clogged up" with the deposits. It is virtually impossible to clean it and the only thing to do is to discard it. Yet, this is no more and no less than 900 cubic meters. We bring the sand from the Urals, wash it, grade it, and stack it. This is a tremendous deal of expensive work done over and over again.

We decided to look for a substitute and found one: keramzit. It does not have the disadvantages of quartz sand. Good results were obtained under laboratory conditions but the trouble was that we were unable to procure the necessary keramzit fraction. We heard that substantial amounts of slag are dumped at copper-nickel mines. We dedided to try it for water clarification purposes and were successful. The only problem was how to ship it to Kalinin.

Naturally, all this represents the struggle against environmental pollution. However, the experience acquired in the course of our work has helped us also to find preventive measures to lower the harmful effect of chemical production. The very nature of the chemical enterprise forced us to consider this problem. The aggressive nature of the medium, and the high gas content demand of us a more attentive attitude toward the equipment and concern for its tightness.

We also greatly benefit from technological improvements and the search for the most economical and optimal work systems. In this area we cooperate with the VNIIVproyekt [All-Union Scientific Research Institute for Water Design]. Recently, for example, a group of innovators, including T. Yefremov, N. Minevich, N. Rumyantsev, and a few more developed a new method for viscose filtration which may be very beneficial to the entire sector. Some enterprise managers believe that extensive involvement with environmental protection is rather troublesome and expensive. Yes, it is expensive. Over the past 12 years we have spent 22 million rubles in water and gas treatment. Let me add, for the sake of comparison, that the same amount was spent on new equipment. In the next five-year period we are scheduled to spend another 11 million. Yet, such expenditures are not only beneficial to the people but profitable to the enterprise itself. Our purification and regeneration systems make it possible to reuse thousands of tons of sulphuric acid, sodium sulphate, copper, zinc, and ammonia, worth over six million rubles per year. Furthermore, the moral satisfaction is worth a great deal.

5003
CSO: 5000

INDUSTRIAL POLLUTION OF BELAYA RIVER

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 26 Sep 79 p 2

[Article by A. Mazitov, inspector, Bashkirskaya ASSR Committee for People's Control, and A. Mingazetdinov, candidate of medical sciences, head of sector, supernumerary department, Bashkirskaya ASSR Committee for People's Control, UFA: "Concerns and Hopes for Belaya River"]

[Text] In terms of beauty, few rivers could compare with the Belaya River, frequently known as the Agidel River in Bashkiria.

The Balaya River does not only flow among beautiful nature. Look at the map and you are bound to identify cities along its banks, containing a number of petroleum refining, chemical, and petrochemical enterprises.

It is entirely understandable for the plants to be located along the banks not only for the sake of admiring the beautiful views. The enterprises need a great deal of fresh water for their technological systems and discharge their effluent into the river. For quite some time a struggle has been waged for their treatment, for making them harmless. To this purpose modern treatment installations are being built for which, judging by the example of the past five-year plan, as much as 30 million rubles are spent annually.

Nevertheless, today there is more concern for the Belaya River than ever before. The water consumption volume is rising while the old tendency of increasing capacities first and then be concerned with environmental protection is still present.

The Bashkirskaya ASSR Committee for People's Control has frequently noted in the course of its investigations that a number of enterprises, with the exception of the "Bashneftekhimzavody" and "Bashneft' " associations, are increasing their water consumption volume with every passing year. For example, over the past nine years the Kaustik Association in Sterlitamak has tripled its amount of water pumped from the river. Correspondingly, the amount of effluent, whose treatment is far from ideal, has increased. Yet, it was presumed that should the association implement the measures

for the treatment and reduction of effluents, issued by the Ministry of Chemical Industry, the situation would be corrected. The facts, however, show otherwise. Only an insignificant percentage of the many measures earmarked for the current five-year plan have been implemented.

The installation of facilities for environmental protection at the neighboring Synthetic Rubber Plant imeni 50-Letiya Bashkirskaya ASSR, which received only recently from the Giprokauchuk Institute an amended plan for increasing production capacities, has also fallen greatly behind the growth of basic production facilities. Why? The explanation is simple: For over four years the institutes under the jurisdiction of the USSR Ministry of Petroleum Refining and Petrochemical Industry have been holding back the issuing of recommendations for the treatment and reduction of the volume of sewage waters.

All these enterprises are located in Sterlitamak where said ministries have created a thick knot of problems whose complex resolution nobody is undertaking. The heads of ministries and of their subordinate enterprises are looking hopefully at a developing possibility: incorporation with other scientific institutes, the Yuzhgiprovodkhoz Design Institute of the RSFSR Ministry of Land Reclamation and Water Economy completed the drafting of technical-economic substantiation for the construction of the big Ishtuganovskoye Reservoir which will be located in the middle reaches of Belaya River. The reservoir will make it possible to resolve a number of problems related to the development of enterprises of various sectors. It will make it possible to control water supplies to industrial centers and agricultural areas. However, according to the plan water consumption will double in the future. With such a volume losses will increase manyfold. Even high-level waste water treatment will not make it possible to achieve the necessary results in the middle reaches of Belaya River.

A different way exists for avoiding an increase in water consumption and reducing and, subsequently, entirely eliminating the draining of effluent in the river. For this reason, in designing and constructing the Ishtuganovskoye Reservoir, the Yuzhgiprovodkhoz and its subcontractors must join efforts with sectorial scientific research institutes and contemplate measures aimed at a maximum reduction of water for enterprise use.

5003
CSO: 5000

UDC 621.643.002.2+502.7

RECULTIVATION OF FOREST LANDS FOLLOWING INSTALLATION OF GAS PIPELINES

Moscow STROITEL'STVO TRUBOPROVODOV in Russian No 9, Sep 79 pp 26-27

[Article by A. N. Vysotskiy, Soyuzgazproyekt, Kiev]

[Text] The "Fundamental Premises on Recultivation of Land Disturbed by Development of Mineral and Peat Deposits and by Geological Exploration, Construction, and Other Operations," approved by Gostekhnika [State Committee for Science and Technology], Gosstroy [State Committee for Construction Affairs], the USSR Ministry of Agriculture, and the Gosleskhoz [State Committee for Forestry], apply mainly to open-cut mines and to waste rock dumps. These provisions were written mainly in application to large construction sites that are reforested after a particular amount of time. It has been discovered that in relation to recultivation of forest lands, the "Fundamental Premises" do not take full enough account of the unique features of building and operating gas pipelines.

The unique features of erecting and operating gas mains routed through forests are as follows.

Tree and brush stands removed during construction due to the need for affording permanent access along the operating gas pipeline for operational transportation and repair and construction equipment must not be restored. According to the SNiP's [Construction Norms and Regulations] stumps must be removed over the entire breadth of the allotted ground in dry sections of the route, and along the strip reserved for the future trench in marshy sections. In places where stumps are not removed, they must be cut down to ground level. In this case it is practically impossible to remove the fertile soil layer prior to logging because of the presence of growing trees, and after logging due to presence of stumps and roots left on the ground.

There is no great need for removing and subsequently restoring the fertile layer. The fact is that herbaceous vegetation usually recovers on its own along forest roads in the country's central regions. In northern regions, such restoration may be intensified as necessary by artificially sowing grasses and applying various fertilizers.

According to the "Norms for Allocating Lands for Gas Mains," SN [Construction Norm] 452-73, the breadth of the strip allotted for pipeline installation in forests has been decreased to minimum dimensions corresponding to cases where the fertile soil layer is not removed.

Recultivation of land following installation of gas pipelines takes only months (or even less) rather than the years required following development of mineral deposits. We should also note that recultivation is complicated by the danger of explosions and fire created by gas pipelines operating at high pressure.

These unique features are accounted for by the requirements of a number of standard-setting documents, particularly the SNiP II-45-75, "Norms for Planning Gas Mains" (Paragraph 1.7); SNiP III-D. 10-72, "Rules for Installing and Accepting Main Pipelines" (Paragraph 2.11); SN 452-73, "Norms for Allocating Lands for Gas Mains" (Table 1, Column 2).

The Soyuzgazproyekt [not further identified] has written and approved, for the Ukrainian SSR Ministry of Agriculture and Ukrainian SSR Gas Industry, the "Statute on Recultivation of Agricultural Lands Allocated for Installation of Gas Mains in Forests of the Ukrainian SSR State Forest Fund," which accounts for the requirements of these standard-setting documents.

Similar statutes have been coordinated with the USSR State Committee for Forestry and the RSFSR Ministry of Forestry for forests of the USSR and RSFSR state forest funds.

According to the new statutes the requirement of initially removing the fertile soil layer, moving it outside the working zone, and subsequently returning it to its place (after the work is completed) do not apply within the limits of a gas pipeline installation route passing through forest lands.

Recultivation in forests of the state forest fund should be limited to just filling in pits formed by stump removal; such pits may be filled with dirt remaining around them. Should there not be enough dirt, additional dirt may be obtained by leveling topographic irregularities, simultaneously with general smoothing of the construction route, without selecting or sorting the dirt.

In northern regions of the country, after pipeline construction is completed, under favorable conditions the entire breadth of the allotted strip may be planted with grasses as a means for preventing and protecting against erosion and thermokarst.

In order to improve the restorative role of grasses, certain fertilizers may be applied as necessary on demand of forestry enterprises within the limits of the strip established by these enterprises. The seeding norm and the types of fertilizer are established locally by the forestry enterprises as well.

Land reclamation, hydraulic engineering, erosion control, and other structures disturbed as a result of gas pipeline installation must be restored.

The changes examined here significantly simplify recultivation of lands allotted for construction of gas mains in forests of the state forest fund, and they help to reduce the time and cost of such recultivation.

This order of recultivation is effective in northern regions, where gas pipelines are laid mainly through forests.

11004
CSO: 5000

UDC 621.643/553.002.2+502.7

ADDITIONAL NATURE PROTECTION MEASURES ANNOUNCED

Moscow STROITEL'STVO TRUBOPROVODOV in Russian No 9, Sep 79 p 27

[Text] The Ministry of Construction of Petroleum and Gas Industry Enterprises is taking additional steps to strengthen nature protection and to improve the use of natural resources. Special attention is being turned to creating and introducing resources insuring a sharp reduction in the loss of minerals during their extraction and processing. Toxic waste sources are being outfitted with purification equipment, the discharge of pollutants into the atmosphere and soil is being minimized, and so on.

The sector's enterprise and organization executives are being made more responsible for nature protection, for sensible use of natural resources, and for timely implementation of the appropriate measures.

Progress in completion of nature protection plans must be considered when summarizing the socialist competition results.

Indicators accounting for implementation, by the enterprises and organizations, of nature protection measures and compliance with the norms and rules of using natural resources and treating and processing production wastes must be written as a supplement to the socialist competition rules. The appropriate revisions and additions must be made to the standard provisions on paying bonuses to workers on the basis of the principal results of their economic activities.

Sources of environmental discharge of toxic substances and production wastes belonging to the ministry's enterprises will be inventoried in 1979-1980. The inventory materials must be submitted to the Main Administration of Capital Construction for summarization, and then submitted to the USSR State Committee for Hydrometeorology and Control of the Natural Environment (for discharges into the air basin) and to the USSR Ministry of Land Reclamation and Water Resources (for discharges into water resources), as well as to the USSR Gossnab (for solid production wastes).

The effectiveness of gas scrubbing and dust trapping devices and water treatment plants used by the sector's enterprises must be checked systematically. Proposals for improving these devices and plants accounting for the achievements of science and technology must be submitted to the Main Administration of Capital Construction for summarization and subsequent submission to the USSR Gosstroy.

Supplements to the construction norms and rules taking account of the need for preventing thermokarst, erosion, and other harmful processes arising in conjunction with construction on permafrost are being written on the basis of methodological instructions from the USSR Gosstroy. The supplements will be submitted to the USSR Gosstroy for approval in 1980.

The Main Administration of Capital Construction has been ordered to intensify surveillance over the planning and erection of new enterprises and facilities and the reconstruction of existing ones, turning special attention to compliance with the rules of protecting the environment from pollution by toxic discharges.

Plans for construction and reconstruction must make greater use of low-waste production operations, waterless production processes, water recycling, wasteless water supply systems, new sewage systems, and other progressive methods for protecting the environment.

11004
CSO: 5000

BRIEFS

NEW PURIFICATION PROCESS--A biological process for purifying sewage which contains chrome compounds has been developed at the Institute of Biology of Inland Waters of the USSR Academy of Sciences. The process is based on a discovery made at this institute which entails determining those microorganisms able to break down chromates and bichromates. As a result pure cultures of bacteria have been grown which can break down chrome. Consequently a sediment forms which can easily be removed. Biological sewage purification is ten times cheaper than chemical purification. [Text] [Bonn DIE WIRTSCHAFT DES OSTBLOCKS 22 Nov 79 p 6]

CSO: 1826

'POLITICAL ECOLOGY MOVEMENT' ESTABLISHED IN DIJON

Paris LE MONDE in French 27 Nov 79 p 10

[Article by Patrick Jarreau: "During Meetings Held at Dijon Europe-Ecology Activists Announce the Establishment of a 'Political Ecology Movement'"]

> [Text] Dijon--On Saturday, 24 November, and Sunday, 25 November, in Dijon, Europe-Ecology activists organized meetings of ecologists, at the end of which they announced the establishment of a "political ecology movement." A temporary office was set up to study the objectives, the organization, and the operation of this movement. In addition, a coordinating committee was formed to unite the initiators of this movement, the Friends of the Earth, and the participants in these meetings who are not associated with either of these two groups.

Should the ecologists equip themselves with a permanent structure for political action? This was the question asked at the meeting in Dijon. In fact, many ecologists feel the need to get away from the improvisational quality which has, until now, marked their participation in electoral conferences, and to give a generally more coherent political expression to their movement. However, the various feelings which are expressed in ecological circles make this a difficult undertaking.

The Europe-Ecology activists, having to their credit the campaign they waged for the European election and the result they achieved, (4.38 percent of the votes), offered at Dijon, to be, if not the federators, at least the initiators, of political ecology. The presence at these meetings of the Network of the Friends of the Earth (RAT), who opposed Europe-Ecology by not participating in the European campaign, indicated a willingness for understanding within the ecological milieu. "Everyone was there," observed a participant. Everyone means, in addition to the Friends of the Earth, all of the regional associations whether or not they participated in Europe-Ecology.

It was not expected that these two elements of the ecological movement--RAT and the associations--would leave the Dijon meetings having formed a unified movement. On Saturday, Mr Brice Lalonde expressed the RAT position. "Get organized, and let us discuss the matter," he said to the other participants in the meeting. But was his wish sincere? Some representatives of the associations were doubtful. They were afraid that the Friends of the Earth, who are now forming a political ecology movement would take a dim view of the establishment of a "competitive" movement, and that they [the Friends] only came to Dijon to prevent it.

The conflict between the RAT and the rest of the ecological mainstream was crystallized during preparations for the European election on the question of relations with political parties. The watchword of Europe-Ecology was: independence vis-a-vis the parties, while some representatives of the Friends of the Earth, particularly Mr Lalonde, wanted an understanding with the PSU [Unified Socialist Party] and the MRG [expansion unknown] for the formation of a minority register. It should be noted, however, that this cleavage cut across both groups, and that the idea of a regrouping of minorities had partisans within Europe-Ecology, just as it had adversaries, the majority, in the final analysis, in the RAT. This did not prevent the Friends of the Earth from being suspected of wanting to make ecology a component of the left, while for most of the representatives of the associations, the movement should hold a position of arbiter between the opposition and the majority, both of whom equally reject "productivists," and are equally incapable of resolving the real problems of the present society.

It was against this background that the sometimes stormy debates were held on Saturday and Sunday. The position expressed by Isabelle Cabut, representative of the newspaper 'LA GUEULE OUVERTE', which consisted of a four-month deferment of the establishment of a movement, was supported, especially by some of the representatives of the Rhone-Alps ecological movement, who felt that the establishment of such a movement should be the result of extensive debate, which would give it a status different from that of a regrouping of the defenders of nature. But this position was also supported by the Friends of the Earth, which made it appear like an attempt on their part to take control of the dynamics of the meeting which were escaping them. The motion, presented on Sunday by Mrs Cabut, obtained a relative majority (55 votes to 45, out of 129 voting).

This vote induced the representatives of Europe-Ecology to leave the halls of debate to form their own "temporary office" of the movement whose establishment they have announced. Through fear of becoming a minority, they did not submit a vote the motion in which they announced the establishment of this movement which caused their initiative to seem to be a split. In their absence, the other participants in the meetings, particularly Mr Lalonde and Mr Francois de Ravignan (NATURE AND PROGRESS) who expressed their wish to leave the hall and who [passage omitted] from the associated

ecological movement. Upon their return, it was decided to establish a coordinating committee uniting the three elements which emerged during the course of the debates, that is, the LAT, [as published] the Europe-Ecology activists, and the supporters of Mrs Cabut's proposals.

The question of the presidential election was not openly raised until the end of the debates when Mr Radanne (RAT) asked that the initiators of the political ecology movement agree not to "parachute" a candidate. The Friends of the Earth and the other participants who were in agreement on the "Cabut motion", feared that the activists of Europe-Ecology obviously did not seek in these meetings a legitimacy which would permit them to designate a candidate for 1981 and to foist him upon the entire movement. Among other things, the formation of a coordinating committee should make it possible to avoid a renewal of this type of vicissitude, which has been recognized in the movement since the preparation for the parliamentary elections in March 1978.

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